121 T3 TH = Test 3 Take-Home

$$\begin{array}{r|rrrrrr} -2 & 1 & -6 & 1 & 56 & -60 & -208 \\ & & -2 & 16 & -34 & -44 & 208 \\ \hline -2 & 1 & -8 & 17 & 22 & -104 & 0 \\ & & -2 & 20 & -74 & 104 & \\ \hline 4 & 1 & -10 & 37 & -52 & 0 & \\ & & 4 & -24 & 52 & & \\ \hline & 1 & -6 & 13 & 0 & & \end{array}$$

$(x+2)(x^4-8x^3+17x^2+22x-104)$

$(x+2)^2(x^3-10x^2+37x-52)$

$$\boxed{\begin{array}{c}(x+2)^2(x-4)(x^2-6x+13) \\ \text{5a} \quad \text{over } \mathbb{R} \quad \text{3pts}\end{array}}$$

$x^2-6x+13=0 \Longrightarrow$

$x^2-6x = -13$

$x^2-6x+3^2=-13+9$

$(x-3)^2=-4$

$x-3 = \pm\sqrt{-4} = \pm 2i$

$x = 3 \pm 2i$

zeros:

4 5pts

$x=-2 \quad m=2$

$x=4 \quad m=1$

$x=3+2i \quad m=1$

$x=3-2i \quad m=1$

TOT = 5 ✓

$x+2$

2pts

$$\boxed{\begin{array}{c}(x+2)^2(x-4)(x-(3+2i))(x-(3-2i)) \\ \text{over } \mathbb{C}\end{array}}$$

5b

6 5pts

$(x+2)^2(x-4)(x^2-6x+13)$

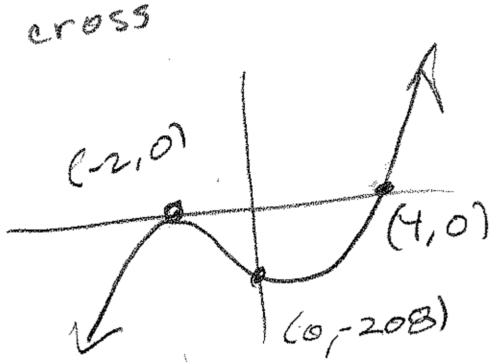
$x=-2$ touch

$x=4$ cross

x^5 + smaller $\Longrightarrow$ ↙ ↗, so

$f(0)=-208$

$\rightsquigarrow (0,-208)$



121 T3 Take-home

5pts 1 (a) $P(x)=5x^4+\text{smaller}$ (b) $g(x)=-5x^5+\text{smaller}$

(c) $h(x)=-x^4+\text{smaller}$ (d) $f(x)=2x+7$

5pts 2 $f(x)=x^5-6x^4+x^3+56x^2-60x-208$

Descartes: 3 or 1 positive zeros (But 1, for sure)

$f(-x)=-x^5-6x^4-x^3+56x^2+60x-208$

ZERO negative (maybe none!)

5pts 3

$$\begin{array}{r|l} 2 & 208 \\ 2 & 104 \\ 2 & 52 \\ 2 & 26 \\ & 13 \end{array}$$

$\pm 1, \pm 2, \pm 4, \pm 8, \pm 16, \pm 13, \pm 26,$

~~$\pm 2 \cdot 13 = \pm 26$~~

$\pm 4 \cdot 13 = \pm 52$, $\pm 8 \cdot 13 = \pm 104$

$\pm 16 \cdot 13 = \pm 208$,

These are all the possible $\frac{p}{q}$'s

p divides 208

q divides 1

5pts 4 We find all real & complex zeros

MAT 121-G11 – Fall, 2011 Test 3 Take-Home

Chapter 3 – 30 pts

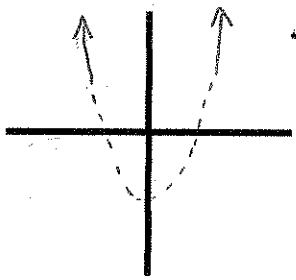
Due Wednesday, October 26th

Name Sandra Garcia

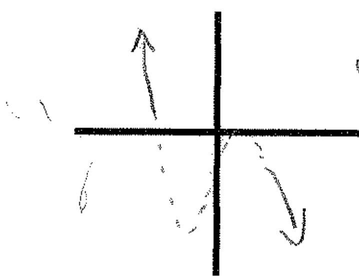
$\frac{20}{30}$

1. (5 pts) For each of the following polynomials, draw the end behavior on the graph.

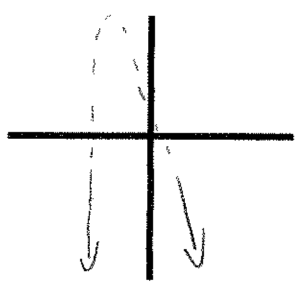
a. $p(x) = 5x^4 - 4x^3 + 2x - 5$



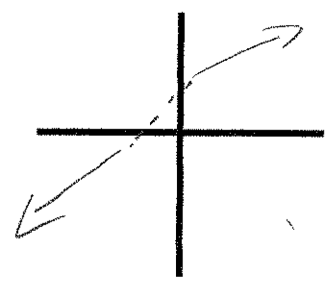
b. $g(x) = -5x^5 + 3x^4 - 5x^2 + 7x - 2$



c. $h(x) = -x^6 - 4x^3 + 2x^2 - 8x + 1$



d. $f(x) = 2x + 7$



5

Let $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$ for problems 2 - 6.

2. (5 pts) What does Descartes Rule of Signs tell you about this function?

Positive Roots: 3 or 1

$f(-x) = -x^5 - 6x^4 - x^3 + 56x^2 + 60x - 208$

2 negative roots OR 0

4

3. (5 pts) Use the Rational Zeros (Roots) Theorem to list the possible rational zeros of f.

$\frac{p}{q} = \pm 1 \pm 2 \pm 4 \pm 8 \pm 26 \pm 52 \pm 104 \pm 208$

$\pm 13, \pm 16$

4

4. (5 pts) Find all real and complex zeros of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, using the rational zero candidates you have from the previous problem. Put your work NEATLY in the space below. **This means doing your work on separate paper, organizing it, and transferring it to the space, below, after you've eliminated the bad guesses. No credit for sloppy work.**

$$\begin{array}{r|rrrrrr}
-2 & 1 & -6 & 1 & 56 & -60 & -208 \\
 & & -2 & 16 & -34 & -44 & 208 \\
\hline
4 & 1 & -8 & 17 & 22 & -104 & 0 \\
 & & 4 & -16 & 4 & 104 & \\
\hline
-2 & 1 & -4 & 1 & 26 & 0 & \\
 & & -2 & 12 & -26 & & \\
\hline
 & 1 & -6 & 13 & 0 & &
\end{array}$$

3

$x^2 - 6x + 13 = 0$

$\boxed{\begin{array}{l} x = -2 \text{ (twice)} \\ x = 4 \end{array}}$

Nonreal zeros?

Solve $x^2 - 6x + 13 = 0$

~~$(x+2)^2 = 4$~~

~~$x + 2 = \pm 1$~~

3

5. Now that you've done all the prep work, write f in factored form, in two ways:

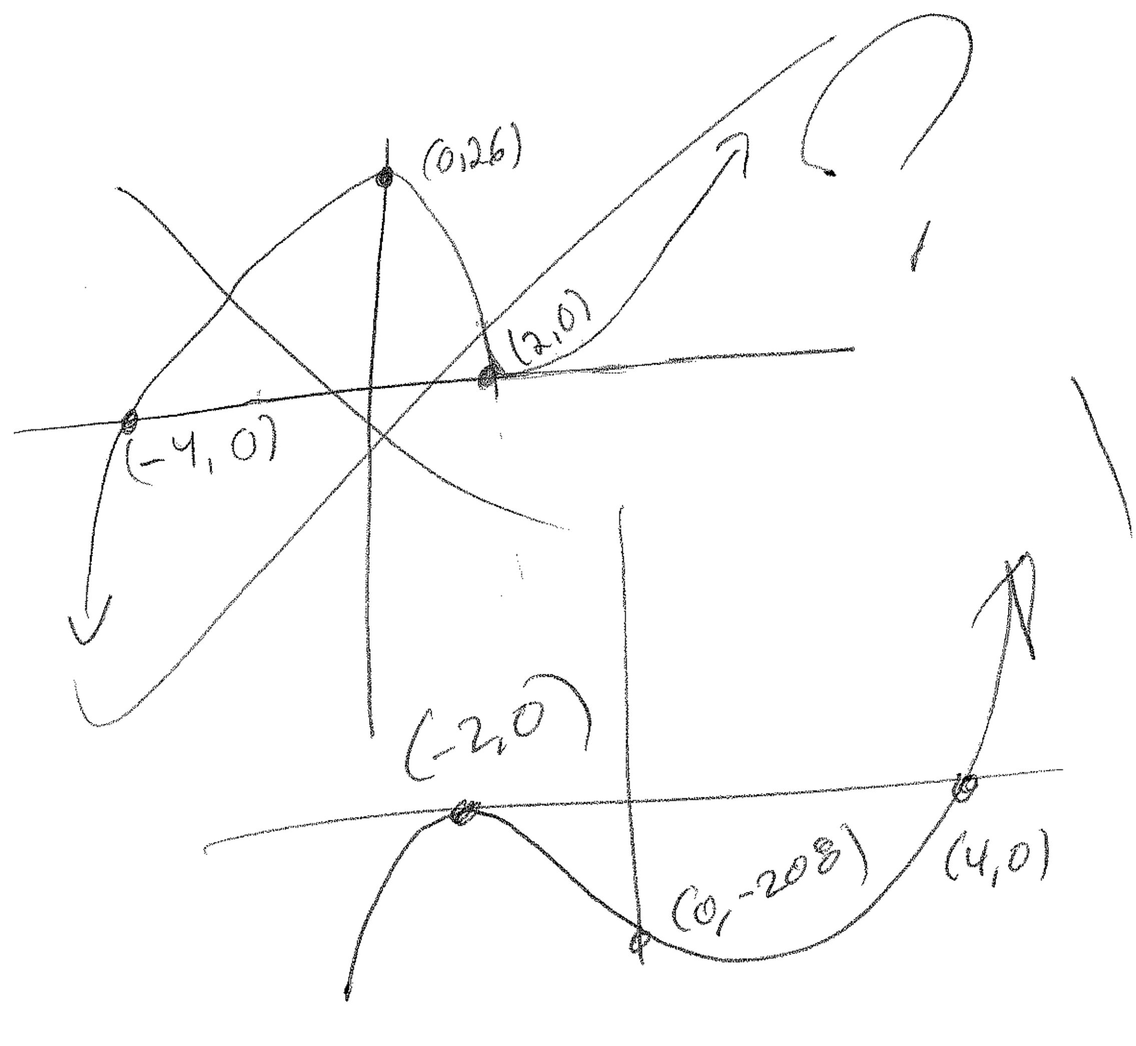
a. (3 pts) Factor f over the REAL number field (Involves an *irreducible quadratic* factor.).

$f(x) = (x+2)^2(x-4)(x^2-6x+13)$ ✓ 3

b. (2 pts) Factor f over the COMPLEX number field. (All *linear* factors.).

$(x-4)(x+2)^2\ \boxed{(x-(2+i))(x-(2-i))}$

6. (5 pts) Now that you've factored it, I want you to sketch the graph of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, showing all intercepts. A *smooth* graph is the goal, here, not a graph that's a slave to the scale.



4

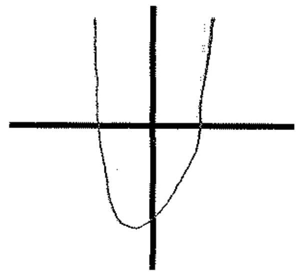
MAT 121-G11 – Fall, 2011 Test 3 Take-Home
Chapter 3 – 30 pts
Due Wednesday, October 26th

Name Stacey Rodriguez

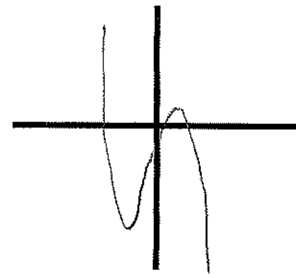
29/30

1. (5 pts) For each of the following polynomials, draw the end behavior on the graph.

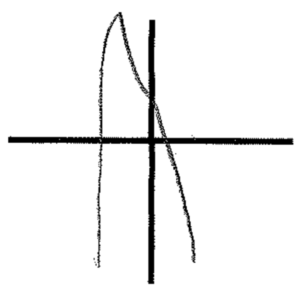
a. $p(x) = 5x^4 - 4x^3 + 2x - 5$



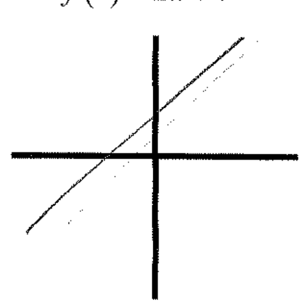
b. $g(x) = -5x^5 + 3x^4 - 5x^2 + 7x - 2$



c. $h(x) = -x^6 - 4x^3 + 2x^2 - 8x + 1$



d. $f(x) = 2x + 7$



5

Let $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$ for problems 2 - 6. $-x - 6x^4 - x^3 + 56x^2 + 60x$ (-208)

2. (5 pts) What does Descartes Rule of Signs tell you about this function?

There are either 3 or Ø positive real zeros and there are either 2 or Ø negative real zeros.

4

3. (5 pts) Use the Rational Zeros (Roots) Theorem to list the possible rational zeros of f.

p(-208): ±1, ±2, ±4, ±8, ±13, ±16, ±26, ±52, ±104, ±208

q(1): ±1

$\frac{p}{q}$: same

5

14

4. (5 pts) Find all real and complex zeros of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, using the rational zero candidates you have from the previous problem. Put your work NEATLY in the space below. **This means doing your work on separate paper, organizing it, and transferring it to the space, below, after you've eliminated the bad guesses. No credit for sloppy work.**

3 or 1 pos

$$\begin{array}{r|rrrrrr} -2 & 1 & -6 & 1 & 56 & -60 & -208 \\ & & -2 & 16 & -34 & -44 & 208 \\ \hline & 1 & -8 & 17 & 22 & -104 & 0 \end{array}$$

$-x^5 - 6x^4 - x^3 + 56x^2 + 60x$ $(-208$

2 or 0 neg

$(x+2)(x^4 - 8x^3 + 17x^2 + 22x - 104)$

$$\begin{array}{r|rrrrr} 4 & 1 & -8 & 17 & 22 & -104 \\ & & 4 & -16 & 4 & 104 \\ \hline & 1 & -4 & 1 & 26 & 0 \end{array}$$

$(x+2)(x-4)(x^3 - 4x^2 + x + 26)$

5

$$\begin{array}{r|rrrr} -2 & 1 & -4 & 1 & 26 \\ & & -2 & 12 & -26 \\ \hline & 1 & -6 & 13 & 0 \end{array}$$

$(x+2)(x+2)(x-4)(x^2 - 6x + 13) \rightarrow \dfrac{6 \pm \sqrt{-16}}{2} = 3 \pm 2i$

$(x+2)(x+2)(x-4)(x-3+2i)(x-3-2i)$

zeros: $-2, 4, 3+2i, 3-2i$

5

5. Now that you've done all the prep work, write f in factored form, in two ways:

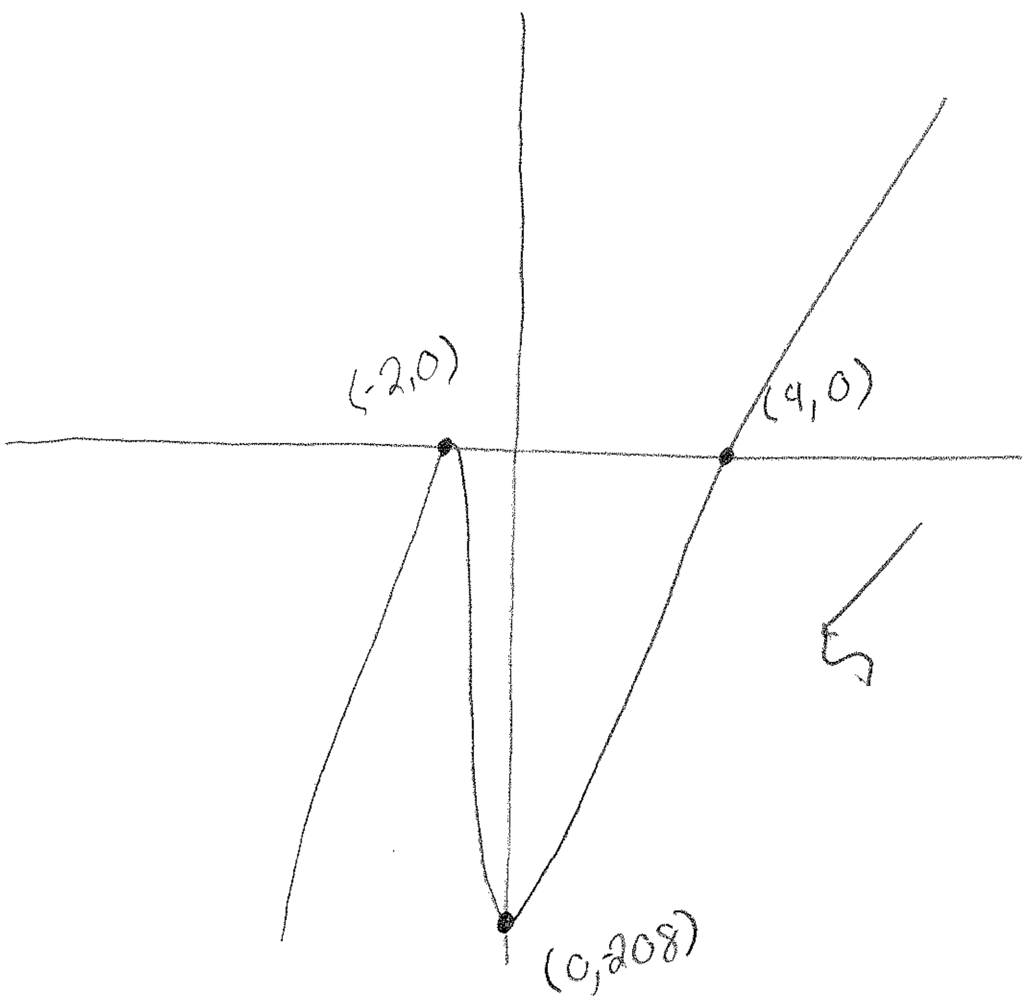
a. (3 pts) Factor f over the REAL number field (Involves an *irreducible quadratic* factor.).

$(x+2)^2(x-4)(x^2-6x+13)$ ✓

b. (2 pts) Factor f over the COMPLEX number field. (All *linear* factors.).

$(x+2)^2(x-4)(x-3+2i)(x-3-2i)$ 5

6. (5 pts) Now that you've factored it, I want you to sketch the graph of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, showing all intercepts. A *smooth* graph is the goal, here, not a graph that's a slave to the scale.



10

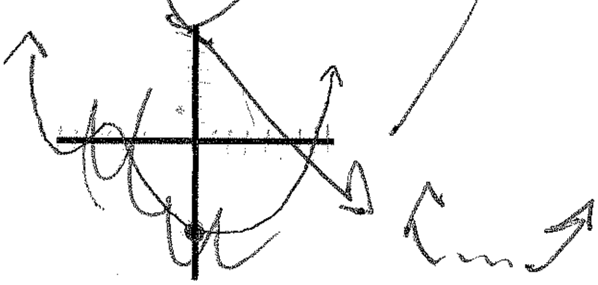
$\frac{22}{30}$

MAT 121-G11 – Fall, 2011 Test 3 Take-Home
Chapter 3 – 30 pts
Due Wednesday, October 26th

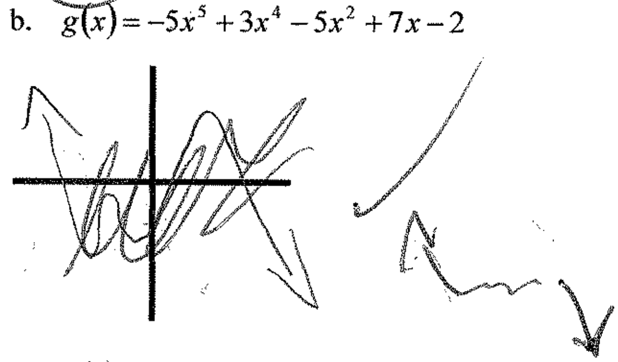
Name Jimmy Georgesen

1. (5 pts) For each of the following polynomials, draw the end behavior on the graph.

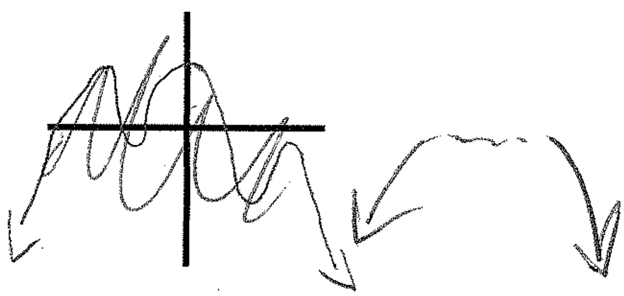
a. $p(x) = 5x^4 - 4x^3 + 2x - 5$



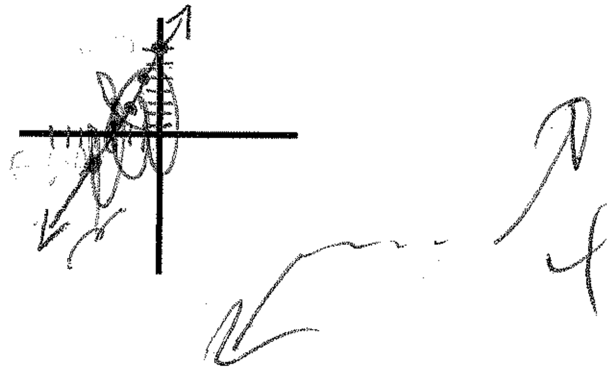
b. $g(x) = -5x^5 + 3x^4 - 5x^2 + 7x - 2$



c. $h(x) = -x^6 - 4x^3 + 2x^2 - 8x + 1$



d. $f(x) = 2x + 7$



Let $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$ for problems 2 - 6.

2. (5 pts) What does Descartes Rule of Signs tell you about this function?

Since the first exponent is 5, there will be at the most 5 zeros

Since there are three different variations of co-efficients of f(x) there will be 3 positive zeros OR

Since there are two differen variation of the co-efficients of f(-x) there will be 2 or 0 negative zeros

The graph will contain 4 turns

3. (5 pts) Use the Rational Zeros (Roots) Theorem to list the possible rational zeros of f.

Possible $\pm 1, \pm 2, \pm 4, \pm 8, \pm 13, \pm 26, \pm 52, \pm 104, \pm 208$

13

4. (5 pts) Find all real and complex zeros of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, using the rational zero candidates you have from the previous problem. Put your work NEATLY in the space below. **This means doing your work on separate paper, organizing it, and transferring it to the space, below, after you've eliminated the bad guesses. No credit for sloppy work.**

$x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$

$$\begin{array}{c|cccccc} \boxed{4} & 1 & -6 & 1 & 56 & -60 & -208 \\ & & 4 & -8 & -28 & 112 & -208 \\ \hline & 1 & -2 & -7 & 28 & 52 & 0 \end{array}$$

$x^4 - 2x^3 - 7x^2 + 28x + 52$

$$\begin{array}{c|ccccc} \boxed{-2} & 1 & -2 & -7 & 28 & 52 \\ & & -2 & 8 & -2 & -52 \\ \hline & 1 & -4 & 1 & 26 & 0 \end{array}$$

$x^3 - 4x^2 + x + 26$

$$\begin{array}{c|cccc} \boxed{-2} & 1 & -4 & 1 & 26 \\ & & -2 & 12 & -26 \\ \hline & 1 & -6 & 13 & 0 \end{array}$$

OK 5

$x^2 - 6x + 13 \rightarrow \dfrac{6 \pm \sqrt{6 - 4(1)(13)}}{2(1)} \rightarrow \dfrac{6 \pm \sqrt{36-52}}{2} \rightarrow \dfrac{6 \pm \sqrt{-16}}{2}$

$\boxed{\text{Zeros } 4, -2, \cancel{2}, 3+2i, 3-2i} \quad \dfrac{6 \pm 4i}{2} \rightarrow \boxed{3 \pm 2i}$

5

5. Now that you've done all the prep work, write f in factored form, in two ways:

a. (3 pts) Factor f over the REAL number field (Involves an *irreducible quadratic* factor.). ?

$$\frac{x^3-4x^2+x+26}{(x-4)\ (x+2)}$$

?

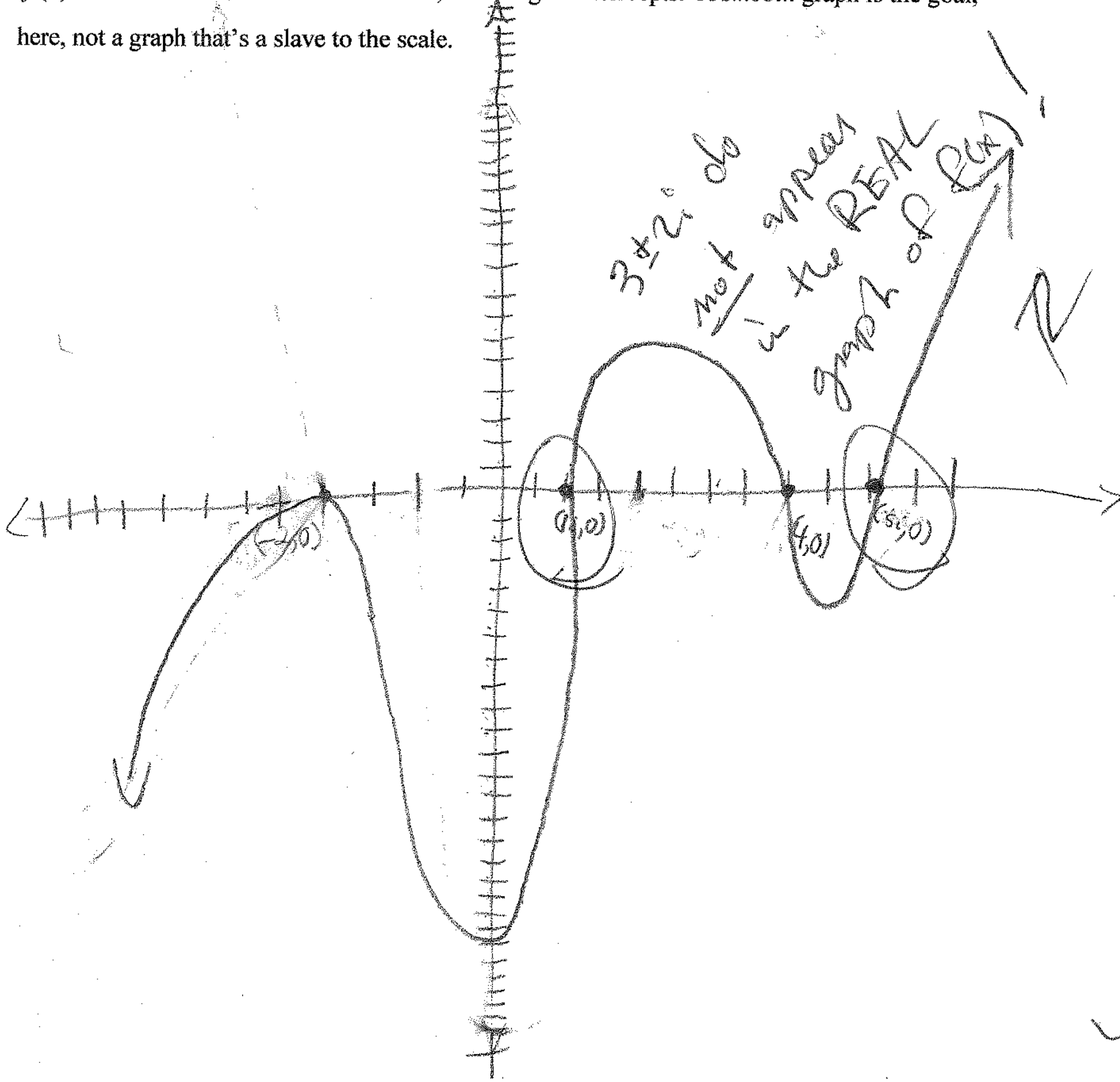
2

b. (2 pts) Factor f over the COMPLEX number field. (All *linear* factors.).

$(x-4)(x+2)(x-3+2i)(x-3-2i)$ $\quad$ $(x-4)(x+2)(x-5i)(x-1i)$

6. (5 pts) Now that you've factored it, I want you to sketch the graph of

$f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, showing all intercepts. A *smooth* graph is the goal, here, not a graph that's a slave to the scale.



Spring 2013

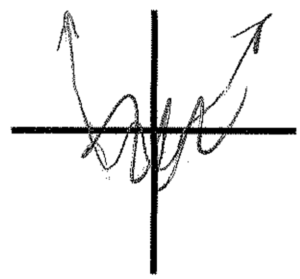
MAT 121-G11 – ~~Fall, 2011~~ Test 3 Take-Home G $\frac{26}{30}$

Chapter 3 – 30 pts Name Siera Searr

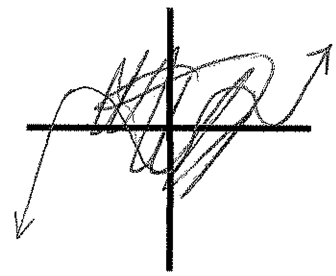
Due Wednesday, October 26th

1. (5 pts) For each of the following polynomials, draw the end behavior on the graph.

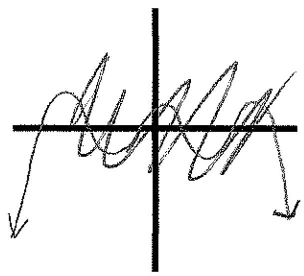
a. $p(x) = 5x^4 - 4x^3 + 2x - 5$



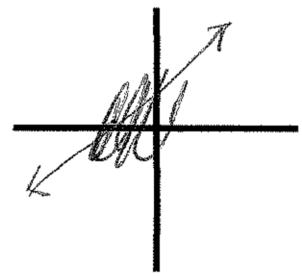
b. $g(x) = -5x^5 + 3x^4 - 5x^2 + 7x - 2$



c. $h(x) = -x^6 - 4x^3 + 2x^2 - 8x + 1$



d. $f(x) = 2x + 7$



4

Let $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$ for problems 2 - 6.

2. (5 pts) What does Descartes Rule of Signs tell you about this function?

There are at most 5 zeros.

3 positive real zeros or 1 positive real zero.

2 negative real zeros or 1 negative real zero.

$-x^5 - 6x^4 - x^3 + 56x^2 + 60x - 208$

4

3. (5 pts) Use the Rational Zeros (Roots) Theorem to list the possible rational zeros of f.

p: ±1, ±2, ±4, ±8, ±13, ±16, ±26, ±52, ±104, ±208

q: ±1

5

$\frac{p}{q}$: ±1, ±2, ±4, ±8, ±13, ±16, ±26, ±52, ±104, ±208

3

4. (5 pts) Find all real and complex zeros of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, using the rational zero candidates you have from the previous problem. Put your work NEATLY in the space below. **This means doing your work on separate paper, organizing it, and transferring it to the space, below, after you've eliminated the bad guesses. No credit for sloppy work.**

$$\begin{array}{r|rrrrrr} -2 & 1 & -6 & 1 & 56 & -60 & -208 \\ & \downarrow & -2 & 16 & -34 & -44 & 208 \\ \hline & 1 & -8 & 17 & 22 & -104 & 0 \end{array} \qquad (x+2)$$

$$\begin{array}{r|rrrrr} -2 & 1 & -8 & 17 & 22 & -104 \\ & \downarrow & -2 & 20 & -52 & 104 \\ \hline & 1 & -10 & 37 & -52 & 0 \end{array} \qquad (x+2)$$

$$\begin{array}{r|rrrr} 4 & 1 & -10 & 37 & -52 \\ & \downarrow & 4 & -24 & 52 \\ \hline & 1 & -6 & 13 & 0 \end{array} \qquad (x-4)$$

$a = 1 \quad b = -6 \quad c = 13$

ok

$(-6)^2 - 4(1)(13)$

$36 - 52$ $\qquad (x - 3 + 2i)$

-16 $\qquad (x - 3 - 2i)$

5

$$x = \frac{-(-6) \pm \sqrt{-16}}{2(1)}$$

$$x = \frac{6 \pm 4i}{2}$$

$x = 3 \pm 2i$

5

5. Now that you've done all the prep work, write f in factored form, in two ways:

a. (3 pts) Factor f over the REAL number field (Involves an *irreducible quadratic* factor.).

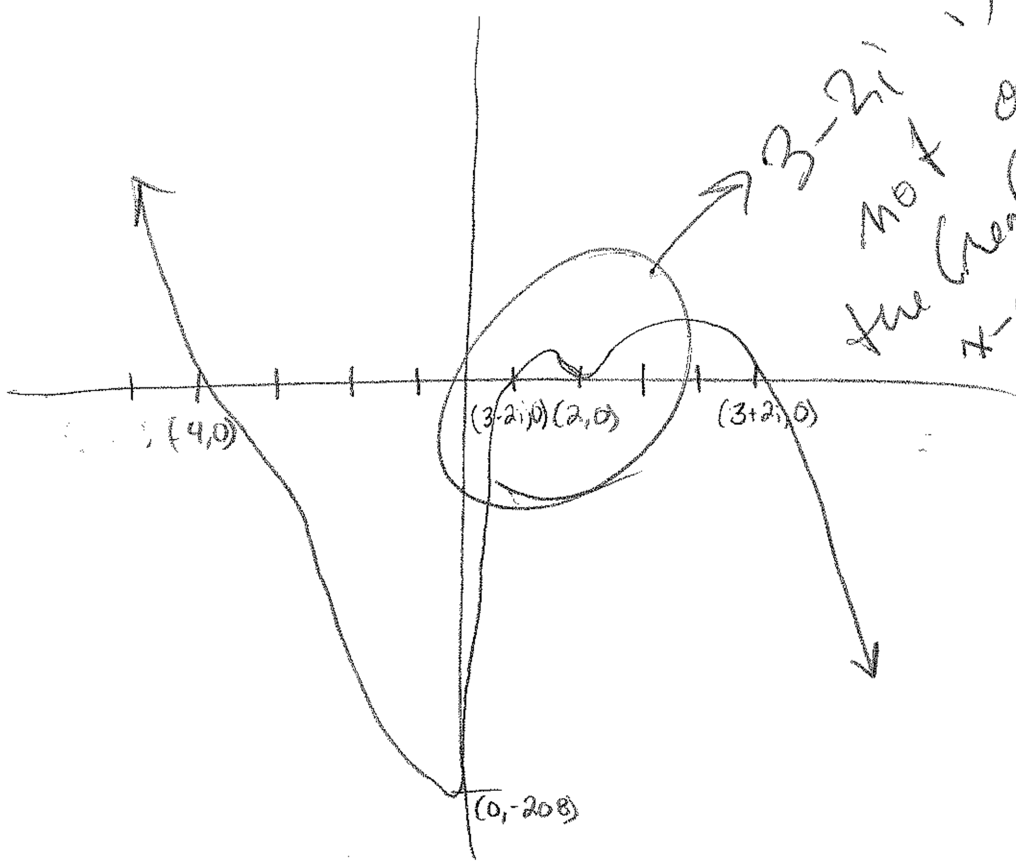
$f(x) = (x+2)^2(x-4)(x^2-6x+13)$

5

b. (2 pts) Factor f over the COMPLEX number field. (All *linear* factors.).

$f(x) = (x+2)^2(x-4)(x-3+2i)(x-3-2i)$

6. (5 pts) Now that you've factored it, I want you to sketch the graph of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, showing all intercepts. A *smooth* graph is the goal, here, not a graph that's a slave to the scale.



3-2i is not on the (real) x-axis!

3

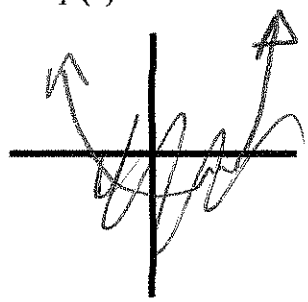
8

MAT 121-G11 – Fall, 2011 Test 3 Take-Home
Chapter 3 – 30 pts Name Ashley Enriquez
Due Wednesday, October 26th

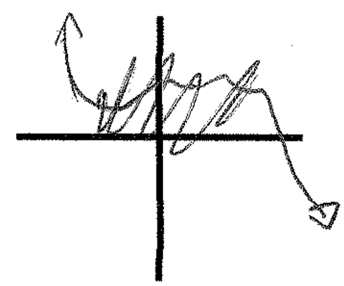
$\frac{28}{30}$

1. (5 pts) For each of the following polynomials, draw the end behavior on the graph.

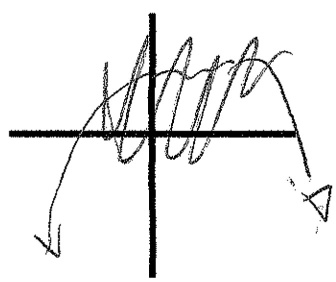
a. $p(x) = 5x^4 - 4x^3 + 2x - 5$



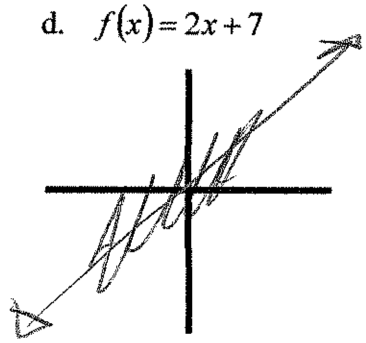
b. $g(x) = -5x^5 + 3x^4 - 5x^2 + 7x - 2$



c. $h(x) = -x^6 - 4x^3 + 2x^2 - 8x + 1$



d. $f(x) = 2x + 7$



4

Let $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$ for problems 2 - 6.

2. (5 pts) What does Descartes Rule of Signs tell you about this function?

$x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$

1 2 3

$f(-x) = -x^5 - 6x^4 - x^3 + 56x^2 + 60x - 208$

3 or 1 possible positive sign changes

1 negative real zero

4

3. (5 pts) Use the Rational Zeros (Roots) Theorem to list the possible rational zeros of f.

$x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$

$\frac{p}{q}$: $\frac{\pm 208}{1}$ ~~1, 2, 4, 8, 13, 16, 26, 52, 104, 208~~
1

$\pm 1, \pm 2, \pm 4, \pm 8, \pm 13, \pm 16, \pm 26, \pm 52, \pm 104, \pm 208$

5

13

4. (5 pts) Find all real and complex zeros of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, using the rational zero candidates you have from the previous problem. Put your work NEATLY in the space below. **This means doing your work on separate paper, organizing it, and transferring it to the space, below, after you've eliminated the bad guesses. No credit for sloppy work.** X5 - 6X4 + X3 + 56 x2 - 60X - 208

$$\begin{array}{r|rrrrrr} -2 & 1 & -6 & 1 & 56 & -60 & -208 \\ & & -2 & 16 & -34 & -44 & 208 \\ \hline & 1 & -8 & 17 & 22 & -104 & \emptyset \end{array}$$

$f(x) = (x+2)(x^4 - 8x^3 + 17x^2 + 22x - 1$

$$\begin{array}{r|rrrrr} 4 & 1 & -8 & 17 & 22 & -104 \\ & & 4 & -16 & 4 & 104 \\ \hline & 1 & -4 & 1 & 26 & \emptyset \end{array}$$

$f(x) = (x+2)(x+4)(x^3 - 4x^2 + 1x + 26$

$$\begin{array}{r|rrrr} -2 & 1 & -4 & 1 & 26 \\ & & -2 & 12 & -26 \\ \hline & 1 & -6 & 13 & \emptyset \end{array}$$

$f(x) = (x+2)(x+2)(x-4)(x^2 - 6x + 13)$

discriminate: $-6^2 - 4(1)(13)$

$36 - 52$

-16

$x = -2, 4, -2\ ; 3+2i$

ok

5

$$\frac{-(-6) \pm \sqrt{-6^2 - 4(1)(13)}}{2(1)}$$

$\boxed{(x-4)(x+2)^2(x-(3+2i))(x-(3-2i))}$

$$\frac{6 \pm \sqrt{-16}}{2} = \frac{6 \pm 4i}{2} = \boxed{3 \pm 2i}$$

5

5. Now that you've done all the prep work, write f in factored form, in two ways:

a. (3 pts) Factor f over the REAL number field (Involves an *irreducible quadratic* factor.).

$f(x) = (x-4)(x+2)^2(x^2-6x+13)$

5

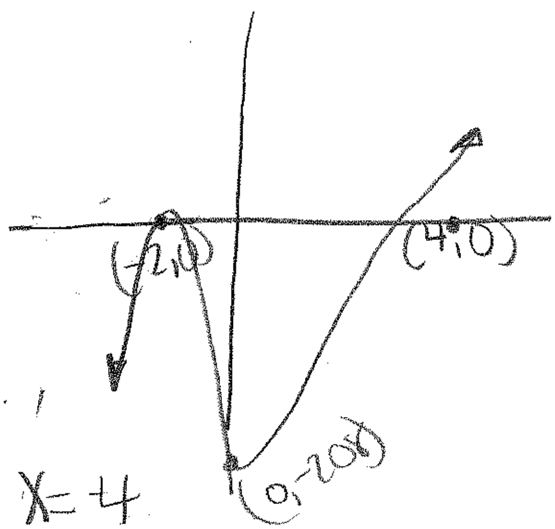
b. (2 pts) Factor f over the COMPLEX number field. (All *linear* factors.).

$f(x) = (x+2)^2(x-4)(x-3+2i)(x-(3-2i))$

5

6. (5 pts) Now that you've factored it, I want you to sketch the graph of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, showing all intercepts. A *smooth* graph is the goal, here, not a graph that's a slave to the scale.

$f(0) = -208$



$f(x) = (x-4)(x+2)^2(0-3+2i)(-3-2i)$

5

$x = 4$
$x = 2$

$f(0) = (0-4)(0+2)^2(0-3+2i)(0-3-2i)$
$= (0,-208)$

10

Scratch paper

#4

-1 | 1 -6 1 56 -60 -208
-6 12 -13 -43 103
1 -12 13 43 -103 105

-2 | 1 -6 1 56 -60 -208
-2 16 -34 -44 208
1 -8 17 22 -104 ∅

$(x+2)(x^4-8x^3+17x^2+22x-104)$

1 | 1 -8 17 +22 -104
1 -7 10 32
1 -7 10 32

2 | 1 -8 17 22 -104
1 2 -12 -10 64
-6 5 32

4 | 1 -8 17 22 -104
4 -16 4 104
1 -4 1 26

$f(x) = (x+2)(x-4)(x^3-4x^2+1x+26)$

MAT 121-G11 – Fall, 2011 Test 3 Take-Home
Chapter 3 – 30 pts
Due Wednesday, October 26th

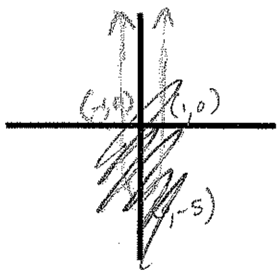
Name Anna Williams

G

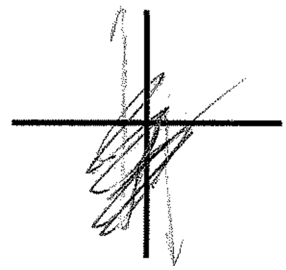
25/30

1. (5 pts) For each of the following polynomials, draw the end behavior on the graph.

a. $p(x) = 5x^4 - 4x^3 + 2x - 5$

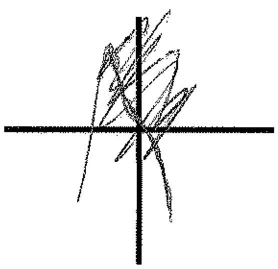


b. $g(x) = -5x^5 + 3x^4 - 5x^2 + 7x - 2$

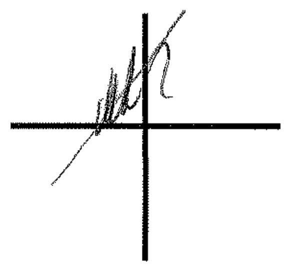


4

c. $h(x) = -x^6 - 4x^3 + 2x^2 - 8x + 1$



d. $f(x) = 2x + 7$



Let $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$ for problems 2 - 6.

2. (5 pts) What does Descartes Rule of Signs tell you about this function?

There are either 3 or 1 positive real zeros, and there are either 2 or 0 negative real zeros

5

3. (5 pts) Use the Rational Zeros (Roots) Theorem to list the possible rational zeros of f.

There are at most 5 real zeros

5

$p: \pm 1, \pm 2, \pm 4, \pm 8, \pm 13, \pm 16, \pm 26, \pm 52, \pm 104, \pm 208$
$q: \pm 1$

$\frac{p}{q}: \pm 1, \pm 2, \pm 4, \pm 8, \pm 13, \pm 16, \pm 26, \pm 52, \pm 104, \pm 208$

14

4. (5 pts) Find all $\boxed{\text{real and complex zeros of}}$ $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, using the rational zero candidates you have from the previous problem. Put your work NEATLY in the space below. **This means doing your work on separate paper, organizing it, and transferring it to the space, below, after you've eliminated the bad guesses. No credit for sloppy work.**

$f(-2) = (-2)^5 - 6(-2)^4 + (-2)^3 + 56(-2)^2 - 60(-2) - 208 = 0$

$(x+2)(x^4 - 8x^3 + 17x^2 + 22x - 104)$

$q_1(x) = x^4 - 8x^3 + 17x^2 + 22x - 104$

$f(-2) = (-2)^4 - 8(-2)^3 + 17(-2)^2 + 22(-2) - 104 = 0$

$(x+2)(x+2)(x^3 - 10x + 37x - 52)$

$q_2(x) = x^3 - 10x^2 + 37x - 52$

$f(4) = (4)^3 - 10(4)^2 + 37(4) - 52 = 0$

$(x+2)(x+2)(x-4)(x^2 - 6x + 13)$

$x = (-2, 0)\ (4, 0)$

What about the nonreal zeros? Break that $x^2 - 6x + 13$ down.

3

5. Now that you've done all the prep work, write f in factored form, in two ways:

a. (3 pts) Factor f over the REAL number field (Involves an *irreducible quadratic* factor.).

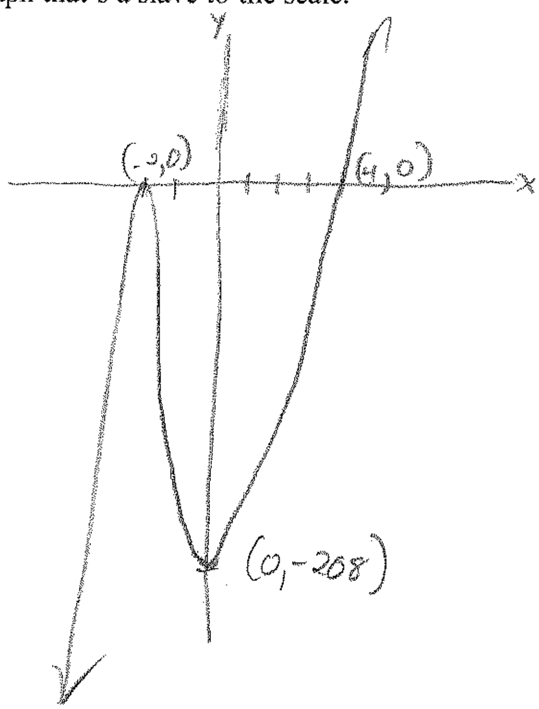
$(x+2)(x+2)(x-4)(x^2-6x+13)$

3

b. (2 pts) Factor f over the COMPLEX number field. (All *linear* factors.).

$(x+2)(x+2)(x-4)(x^2-6x+13)$

6. (5 pts) Now that you've factored it, I want you to sketch the graph of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, showing all intercepts. A *smooth* graph is the goal, here, not a graph that's a slave to the scale.



5

90

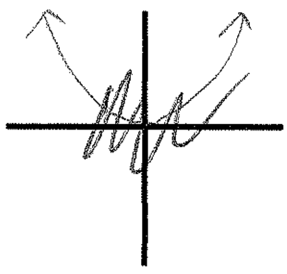
MAT 121-G11 – Fall, 2011 Test 3 Take-Home
Chapter 3 – 30 pts
Due Wednesday, October 26th

Name Todd Karl

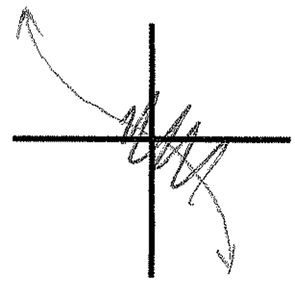
G $\frac{29}{30}$

1. (5 pts) For each of the following polynomials, draw the end behavior on the graph.

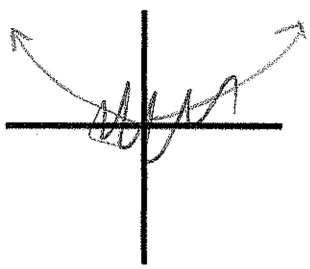
a. $p(x) = 5x^4 - 4x^3 + 2x - 5$



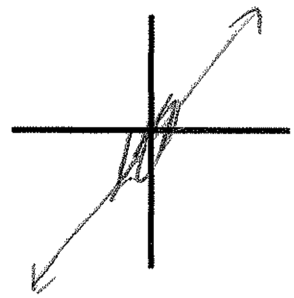
b. $g(x) = -5x^5 + 3x^4 - 5x^2 + 7x - 2$



c. $h(x) = -x^6 - 4x^3 + 2x^2 - 8x + 1$



d. $f(x) = 2x + 7$



ok 5

Let $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$ for problems 2 - 6.

2. (5 pts) What does Descartes Rule of Signs tell you about this function?

There are three variations in the signs of $f(x)$, and we should expect three or zero positive real zeros. It also tells me that there are two variations in the signs of $f(-x)$, and that we should expect two or zero negative real zeros.

3. (5 pts) Use the Rational Zeros (Roots) Theorem to list the possible rational zeros of f.

P: $\pm 1, \pm 2, \pm 4, \pm 8, \pm 13, \pm 16, \pm 26, \pm 52, \pm 104, \pm 208$

Q: ± 1

$\frac{P}{Q} = \pm 1, \pm 2, \pm 4, \pm 8, \pm 13, \pm 16, \pm 26, \pm 52, \pm 104, \pm 208$

5

4. (5 pts) Find all real and complex zeros of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, using the rational zero candidates you have from the previous problem. Put your work NEATLY in the space below. **This means doing your work on separate paper, organizing it, and transferring it to the space, below, after you've eliminated the bad guesses. No credit for sloppy work.**

$$\begin{array}{r|rrrrrr} -2 & 1 & -6 & 1 & 56 & -60 & -208 \\ & & -2 & 16 & -34 & -44 & 208 \\ \hline & 1 & -8 & 17 & 22 & -104 & 0 \end{array}$$

$(x+2)(x^4 - 8x^3 + 17x^2 + 22x - 104)$

$$\begin{array}{r|rrrrr} -2 & 1 & -8 & 17 & 22 & -104 \\ & & -2 & 20 & -74 & 104 \\ \hline & 1 & -10 & 37 & -52 & 0 \end{array}$$

$(x+2)^2(x^3 - 10x^2 + 37x - 52)$

$$\begin{array}{r|rrrr} 4 & 1 & -10 & 37 & -52 \\ & & 4 & -24 & 52 \\ \hline & 1 & -6 & 13 & 0 \end{array}$$

$(x+2)^2(x-4)(x^2 - 6x + 13)$

5

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$(x+2)^2(x-4)(x^2-6x+13)$

$$\frac{6 \pm \sqrt{36 - 4(13)}}{2}$$

$$\frac{6 \pm \sqrt{-16}}{2}$$

$$\frac{6 \pm 4i}{2} = 3 \pm 2i$$

$x = -2$, multiplicity $= 2$

$x = 4$, multiplicity $= 1$

non-real $=$ $x = 3 \pm 2i$, multiplicity $= 1$

5

5. Now that you've done all the prep work, write f in factored form, in two ways:

a. (3 pts) Factor f over the REAL number field (Involves an *irreducible quadratic* factor.).

$$(x+2)^2 (x-4) (x^2-6x+13)$$

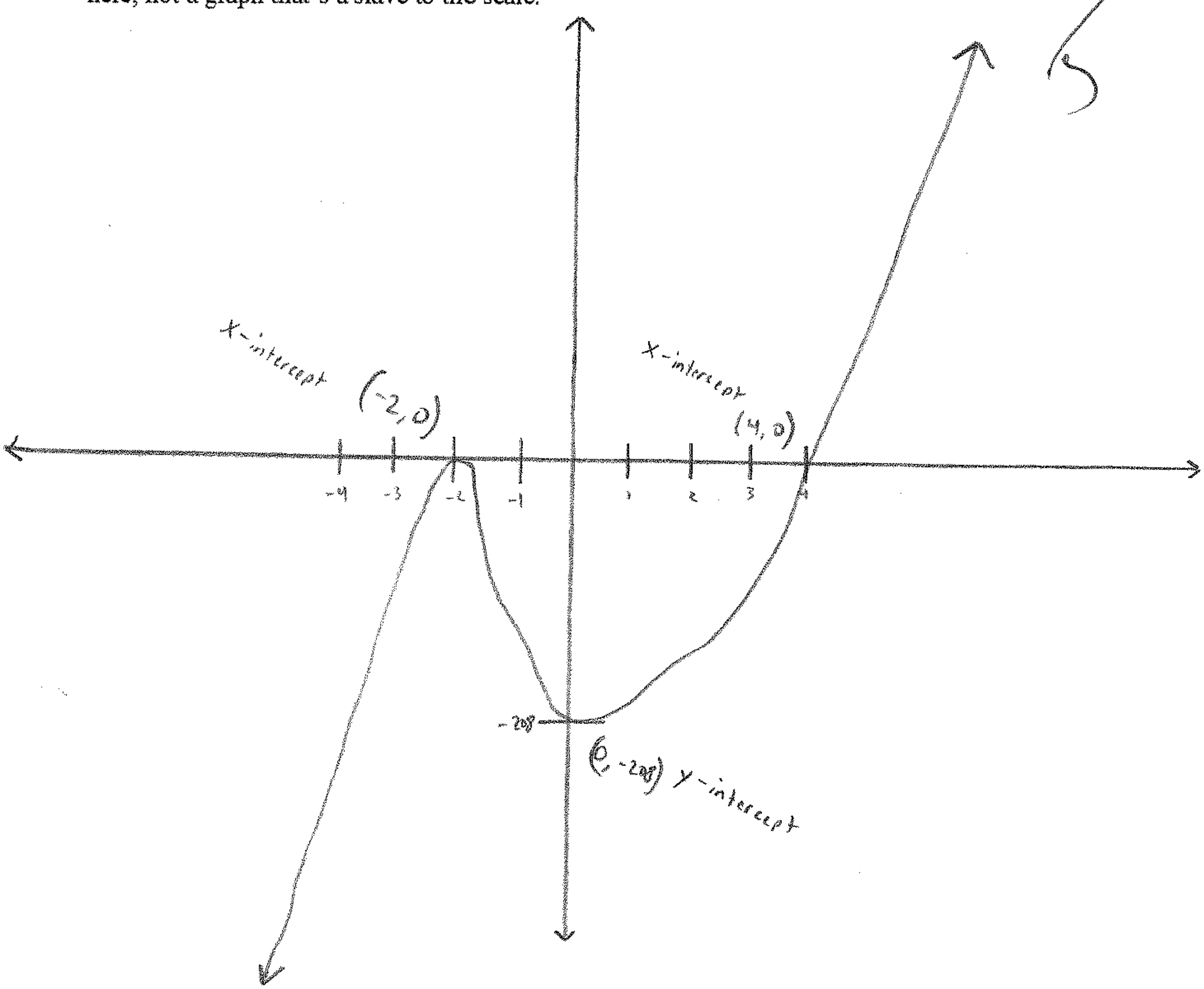
b. (2 pts) Factor f over the COMPLEX number field. (All *linear* factors.).

$$(x+2)^2 (x-4) (x-(3+2i)) (x-(3-2i))$$

5

6. (5 pts) Now that you've factored it, I want you to sketch the graph of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, showing all intercepts. A *smooth* graph is the goal, here, not a graph that's a slave to the scale.

5



10

MAT 121-G11 – Fall, 2011 Test 3 Take-Home

Chapter 3 – 30 pts

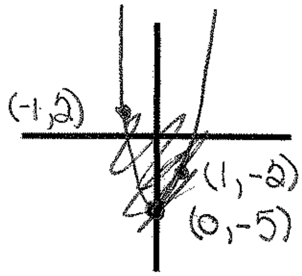
Due Wednesday, October 26th

Name Monica Brudendistel

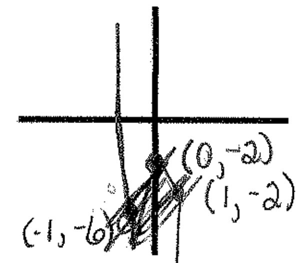
20/30

1. (5 pts) For each of the following polynomials, draw the end behavior on the graph.

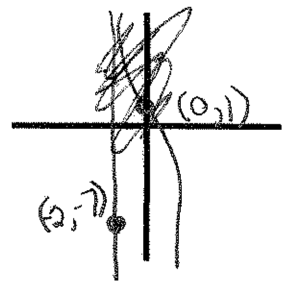
a. $p(x) = 5x^4 - 4x^3 + 2x - 5$



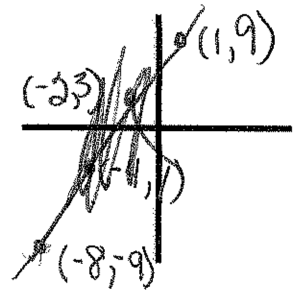
b. $g(x) = -5x^5 + 3x^4 - 5x^2 + 7x - 2$



c. $h(x) = -x^6 - 4x^3 + 2x^2 - 8x + 1$



d. $f(x) = 2x + 7$



4

Let $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$ for problems 2 - 6.

2. (5 pts) What does Descartes Rule of Signs tell you about this function?

there is at most 5 real zeros
3 variations in signs
3 or 1 positive zeros and 2 or 0 possible negative roots

ok 5

3. (5 pts) Use the Rational Zeros (Roots) Theorem to list the possible rational zeros of f.

$\frac{p = 208}{q = 1}$ $\pm 1, \pm 2, \pm 4 \pm 8, \pm 13, \pm 16, \pm 26 \pm 52 \pm 104, \pm 20$

5

14

4. (5 pts) Find all real and complex zeros of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, using the rational zero candidates you have from the previous problem. Put your work NEATLY in the space below. **This means doing your work on separate paper, organizing it, and transferring it to the space, below, after you've eliminated the bad guesses. No credit for sloppy work.** $-2, 4$

1) 1 -6 1 56 -60 -208
1 -5 -4 52 -8
1 -5 -4 52 -8 -216

-1) 1 -6 1 56 -60 -208
-1 7 -8 -48 108
1 -7 8 48 -108 -100

2) 1 -6 1 56 -60 -208
2 -8 -14 84 48
1 -4 -7 42 24 -160

-2) 1 -6 1 56 -60 -208
-2 16 -34 -44 208
1 -8 17 22 -104 0

4) 1 -6 1 56 -60 -208
4 -8 -28 112 208
1 -2 -7 28 52 0

-4) 1 -6 1 56 -60 -208
-4 40 -384 1776
1 -10 96 -444 1568

8) 1 -6 1 56 -60 -208
8 16 136 1536 11808
1 2 17 192 1476 11600

-8) 1 -6 1 56 -60 -208
-8 112 -896 6720 -53280
1 -14 113 -840 6660 -53488

13) 1 -6 1 56 -60 -208
1 1391 1196 16276 210808
1 7 92 1252 16216 210600

-13) 1 -6 1 56 -60 -208
1 -13 247 -3224 41184 -534612
1 -19 248 -3168 41124 -534820

16) 1 -6 1 56 -60 -208
16 160 3456 54336
1 10 216 3396 54128

-16) 1 -6 1 56 -60 -208
-16 352 -5648 89472 -1430592
1 -22 353 -5592 89412 -1430800

26) 1 -6 1 56 -60 -208
26520 13546 353652 9193392
1 20521 13602 353592 9193184

-26) 1 -6 1 56 -60 -208
-26 832 21658 561652 -14601392
1 -32 833 -21602 561592 -14601600

52) 1 -6 1 56 -60 -208
52 2392
1 46 2393

-52) 1 -6 1 56 -60 -208
1

You're not using the "depressed" polynomial after you had zeros

Non real?

5. Now that you've done all the prep work, write f in factored form, in two ways:

a. (3 pts) Factor f over the REAL number field (Involves an *irreducible quadratic* factor.).

$f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$

$f(-2) = (-2)^5 - 6(-2)^4 + 56(-2)^2 - 60(-2) - 208 = 152$

$f(4) = (4)^5 - 6(4)^3 + 56(4)^2 - 60(4) - 208 = 1088$

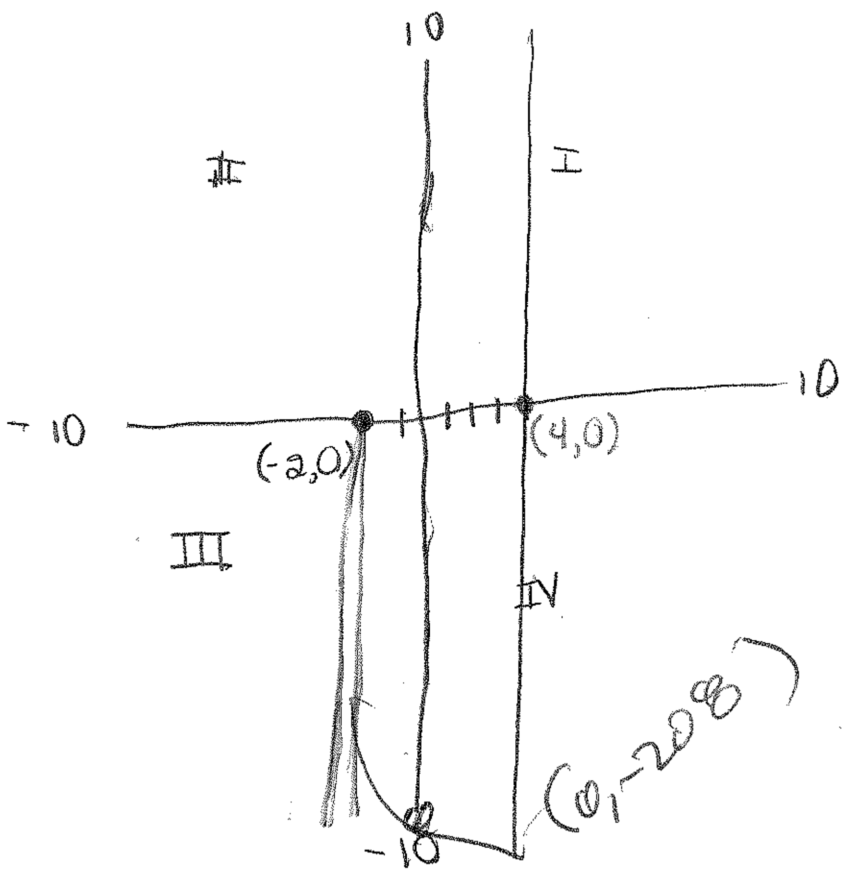
0

b. (2 pts) Factor f over the COMPLEX number field. (All *linear* factors.).

$f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$

$f(-x) = -x^5 - 6x^4 - 56x^2 + 60x + 208$

6. (5 pts) Now that you've factored it, I want you to sketch the graph of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, showing all intercepts. A *smooth* graph is the goal, here, not a graph that's a slave to the scale.



4

5) $f(x)=x^5-6x^4+x^3+56x^2-60x-208$

$x^5-6x^4+x^3+56x^2-60x-208=0$

$x^5-6x^4+x^3+56x^2-60x=208$

$x^4(x-6)\ x^2(x+56)\ 4(x+52)$

Cannot be factored $\varnothing$

L

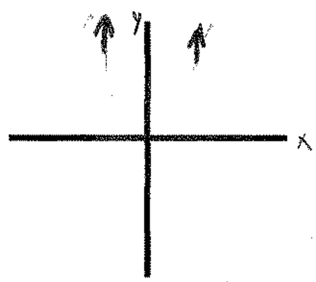
30/30

MAT 121-G11 – Fall, 2011 Test 3 Take-Home
Chapter 3 – 30 pts
Due Wednesday, October 26th

Name Mikaya Chinn

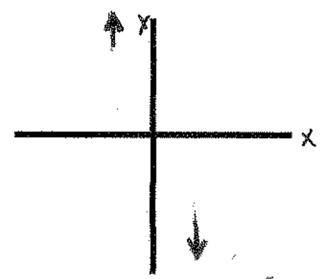
1. (5 pts) For each of the following polynomials, draw the end behavior on the graph.

a. $p(x)=5x^4-4x^3+2x-5$



looks like $y=5x^4$

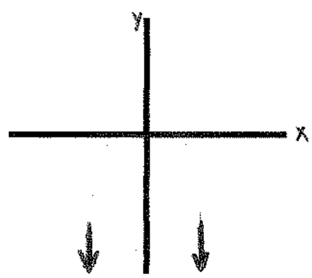
b. $g(x)=-5x^5+3x^4-5x^2+7x-2$



looks like $y=-5x^5$

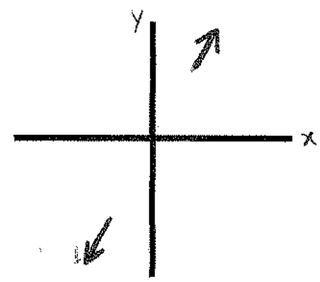
5

c. $h(x)=-x^6-4x^3+2x^2-8x+1$



looks like $y=-x^6$

d. $f(x)=2x+7$



looks like $y=2x$

Let $f(x)=x^5-6x^4+x^3+56x^2-60x-208$ for problems 2 - 6.

2. (5 pts) What does Descartes Rule of Signs tell you about this function?

positive roots → f(x) has 3 sign changes → 3 or 1 + roots
negative roots → f(−x) has 1 sign change → 2 or 0 − roots

5

3. (5 pts) Use the Rational Zeros (Roots) Theorem to list the possible rational zeros of f.

Potential rational zeros of f(x) are

$\frac{p}{q}=\pm1,\pm2,\pm4,\pm8,\pm13,\pm16,\pm26,\pm52,\pm104,\pm208$

5

6

Mikaya Chinn

4. (5 pts) Find all real and complex zeros of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, using the rational zero candidates you have from the previous problem. Put your work NEATLY in the space below. **This means doing your work on separate paper, organizing it, and transferring it to the space, below, after you've eliminated the bad guesses. No credit for sloppy work.**

$f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$

Of the list of possible rational zeros for f(x),

$f(-2) = 0$ and $f(4) = 0$

-2	1	-6	1	56	-60	-208
		-2	16	-34	-44	208
	1	-8	17	22	-104	0

4	1	-8	17	22	-104
		4	-16	4	104
	1	-4	1	26	0

$a = x^3 - 4x^2 + x + 26$

$f(x) = (x+2)(x-4)\underbrace{(x^3 - 4x^2 + x + 26)}_{a}$ → potential rational zeros of a:

$\frac{p}{q} = \pm 1, \pm 2, \pm 13, \pm 26$

$f(-2) = 0$

-2	1	-4	1	26
		-2	12	-26
	1	-6	13	0

$a = (x+2)(x^2 - 6x + 13)$

$f(x) = (x+2)(x-4)(x+2)(x^2 - 6x + 13)$ → $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = -2, 4, 3 \pm 2i$ are the zeros

$x = \frac{6 \pm \sqrt{(-6)^2 - 4(1)(13)}}{2(1)}$

$x = \frac{6 \pm \sqrt{-16}}{2}$

$x = \frac{6 \pm 4i}{2} = 3 \pm 2i$

4.5

REAL ZEROS OF f(x)

(-2, 0) [multiplicity 2]

(4, 0) → x-intercepts

COMPLEX ZEROS OF f(x)

(3 - 2i, 0)

(3 + 2i, 0)

→ Does Not Apply to nonreal zeros

4.5

Mikaya Chinn

5. Now that you've done all the prep work, write f in factored form, in two ways:

a. (3 pts) Factor f over the REAL number field (Involves an *irreducible quadratic* factor.).

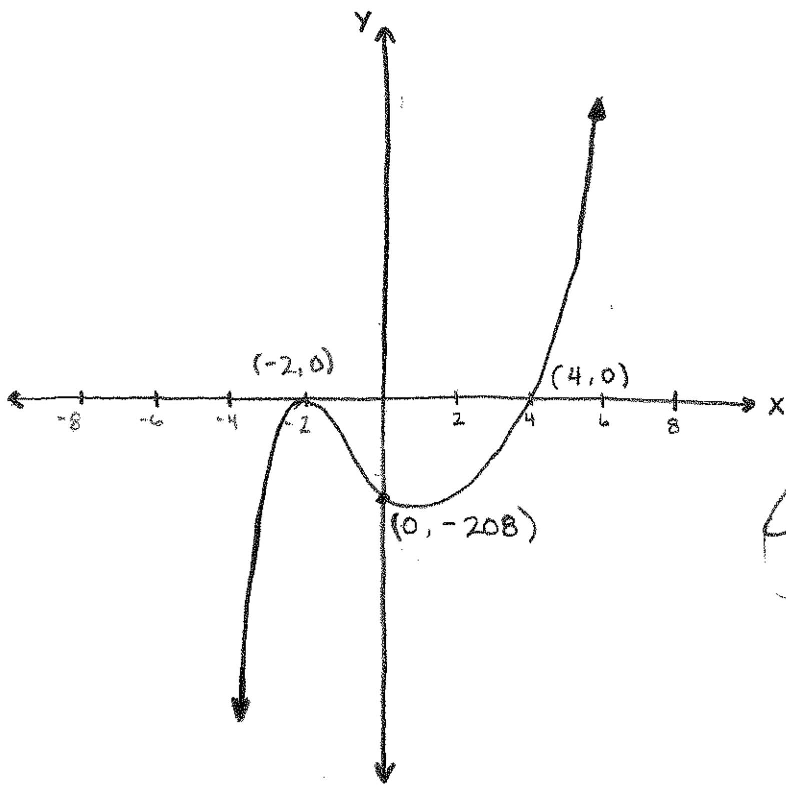
$f(x) = (x+2)^2(x-4)(x^2-6x+13)$

5

b. (2 pts) Factor f over the COMPLEX number field. (All *linear* factors.).

$f(x) = (x+2)^2(x-4)(x-3+2i)(x-3-2i)$

6. (5 pts) Now that you've factored it, I want you to sketch the graph of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, showing all intercepts. A *smooth* graph is the goal, here, not a graph that's a slave to the scale.



5

10

28/30

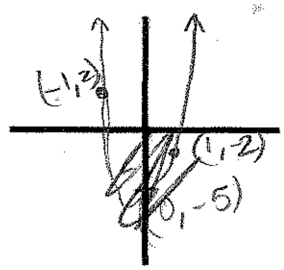
MAT 121-G11 – Fall, 2011 Test 3 Take-Home

Chapter 3 – 30 pts Name Salina Harvey

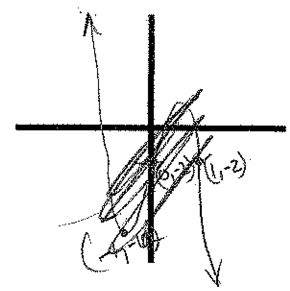
Due Wednesday, October 26th

1. (5 pts) For each of the following polynomials, draw the end behavior on the graph.

a. $p(x)=5x^4-4x^3+2x-5$

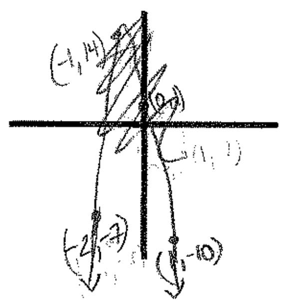


b. $g(x)=-5x^5+3x^4-5x^2+7x-2$

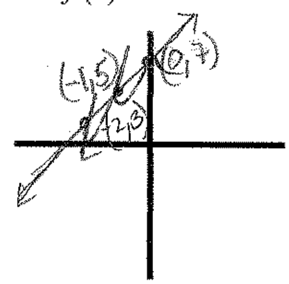


4

c. $h(x)=-x^6-4x^3+2x^2-8x+1$



d. $f(x)=2x+7$



$F(-x)=(-x)^5-6(-x)^4+(-x)^3+56(-x)^2-60(-x)-208$

$=-x-6(x)+(-x)+56(x)-60(-x)-208$

$=-x^5-6x^4-x^3+56x^2+60x-208$

Let $f(x)=x^5-6x^4+x^3+56x^2-60x-208$ for problems 2 - 6.

2. (5 pts) What does Descartes Rule of Signs tell you about this function?

3 or 1 Positive Real Zeros

2 or 0 Negative Real zeros

There will be 5 roots or 5 zeros no matter what

5

3. (5 pts) Use the Rational Zeros (Roots) Theorem to list the possible rational zeros of f.

Constant Term 208, factors 1, 2, 4, 8, 13, 16, 26, 52, 104, 208

leading coefficient is 1

Rational Roots Test $\pm\frac{1,2,4,8,13,16,26,52,104,208}{1}$

$=\pm1, \pm2, \pm4, \pm8, \pm13, \pm16, \pm26, \pm52, \pm104, \pm208$

$\frac{p:\ \pm1, \pm2, \pm4, \pm8, \pm13, \pm16, \pm26, \pm52, \pm104, \pm208}{q:\ \pm1}$

ok 5

14

4. (5 pts) Find all real and complex zeros of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, using the rational zero candidates you have from the previous problem. Put your work NEATLY in the space below. **This means doing your work on separate paper, organizing it, and transferring it to the space, below, after you've eliminated the bad guesses. No credit for sloppy work.**

$(x+2)$

$f(-2) = (-2)^5 - 6(-2)^4 + (-2)^3 + 56(4) - 60(-2) - 208$
$= -32 - 6(16) + (-8) + 56(4) + 120 - 208$
$= -32 - 96 - 8 + 224$
$= 0$

-2	1	-6	1	56	-60	-208
		-2	16	-34	-44	208
	1	-8	17	22	-104	0

$(x-4)$

$f(4) = (4)^5 - 6(4)^4 + (4)^3 + 56(4)^2 - 60(4) - 208$
$= 1024 - 6(256) + 896 - 240 - 208$
$= 1024 - 1536 + 896 - 240 - 208$
$= 0$

4	1	-8	17	22	-104
		4	-14	4	104
	1	-4	1	26	0

$x+2$ $f(-2) =$

-2	1	-4	1	26
		-2	12	-26
	1	-6	13	0

x-term $= -6$ $x^2 - 6x + 13 = 0$

half of x term $= -3$ $x^2 - 6x = -13$

$x^2 = (-3)^2 = 9$ $x^2 - 6x + 9 = -13 + 9$

$x^2 - 6x + 9 = -4$

$(x-3)^2 = -4$

$x - 3 = \pm\sqrt{-4}$

$x = 3 \pm \sqrt{-4}$

$x = 3 + 2i$

$x = 3 - 2i$

$(x+2)^2(x-4)[x-(3+2i)][x-(3-2i)]$

5. Now that you've done all the prep work, write f in factored form, in two ways:

a. (3 pts) Factor f over the REAL number field (Involves an *irreducible quadratic* factor.).

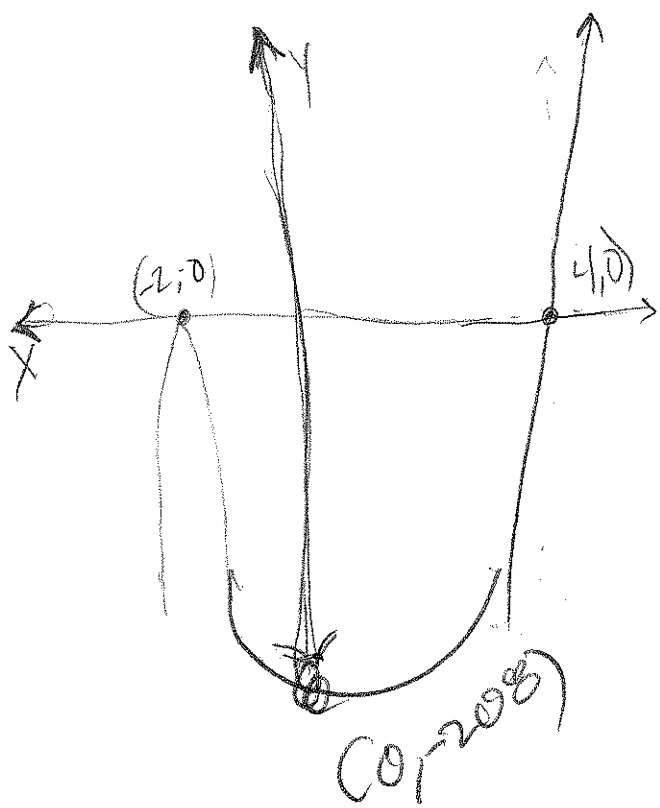
$(x+2)^2(x-4)(x^2-6x+13)$

5

b. (2 pts) Factor f over the COMPLEX number field. (All *linear* factors.).

$(x+2)^2(x-4)(x-3-2i)(x-3+2i)$

6. (5 pts) Now that you've factored it, I want you to sketch the graph of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, showing all intercepts. A *smooth* graph is the goal, here, not a graph that's a slave to the scale.



4

9

MAT 121-G11 – Fall, 2011 Test 3 Take-Home
Chapter 3 – 30 pts
Due Wednesday, October 26th

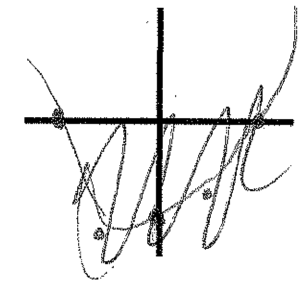
Name Corrina Arzola

21/30

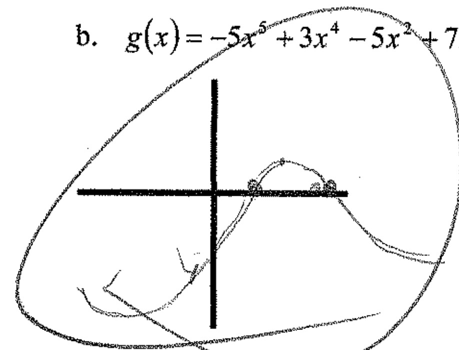
G

1. (5 pts) For each of the following polynomials, draw the end behavior on the graph.

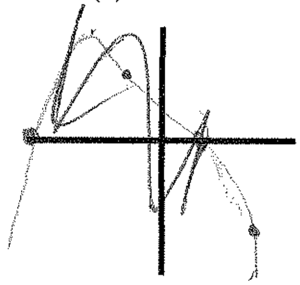
a. $p(x) = 5x^4 - 4x^3 + 2x - 5$



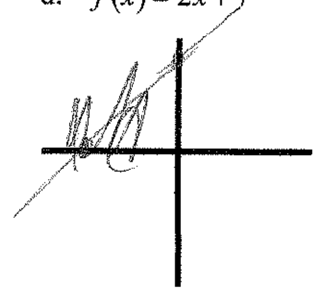
b. $g(x) = -5x^5 + 3x^4 - 5x^2 + 7x - 2$



c. $h(x) = -x^6 - 4x^3 + 2x^2 - 8x + 1$



d. $f(x) = 2x + 7$



Let $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$ for problems 2 - 6.

2. (5 pts) What does Descartes Rule of Signs tell you about this function?

Descartes Rule of Signs tells me that this is a positive case. Four is the maximum possible number of zeros for the polynomial.

0

3. (5 pts) Use the Rational Zeros (Roots) Theorem to list the possible rational zeros of f.

$Q = \pm 1$

$P = \pm 1, \pm 2, \pm 4, \pm 8, \pm 16, \pm 208, \pm 104, \pm 52, \pm 26, \pm 13$

$\boxed{\frac{P}{Q} = \pm 1, \pm 2, \pm 4, \pm 8, \pm 16, \pm 208, \pm 104, \pm 52, \pm 26, \pm 13}$

5

4. (5 pts) Find all real and complex zeros of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, using the rational zero candidates you have from the previous problem. Put your work NEATLY in the space below. **This means doing your work on separate paper, organizing it, and transferring it to the space, below, after you've eliminated the bad guesses. No credit for sloppy work.**

$f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$

$(x+2)^2(x-4)(x^2-6x+13)$

$x_1 = -2$

$x_2 = -2$

$x_3 = 4$

$x_4 = 3+2i$

$x_5 = 3-2i$

5

The rational zeros ~~candidates~~ are -2 and 4.

5

5. Now that you've done all the prep work, write f in factored form, in two ways:

a. (3 pts) Factor f over the REAL number field (Involves an *irreducible quadratic* factor.).

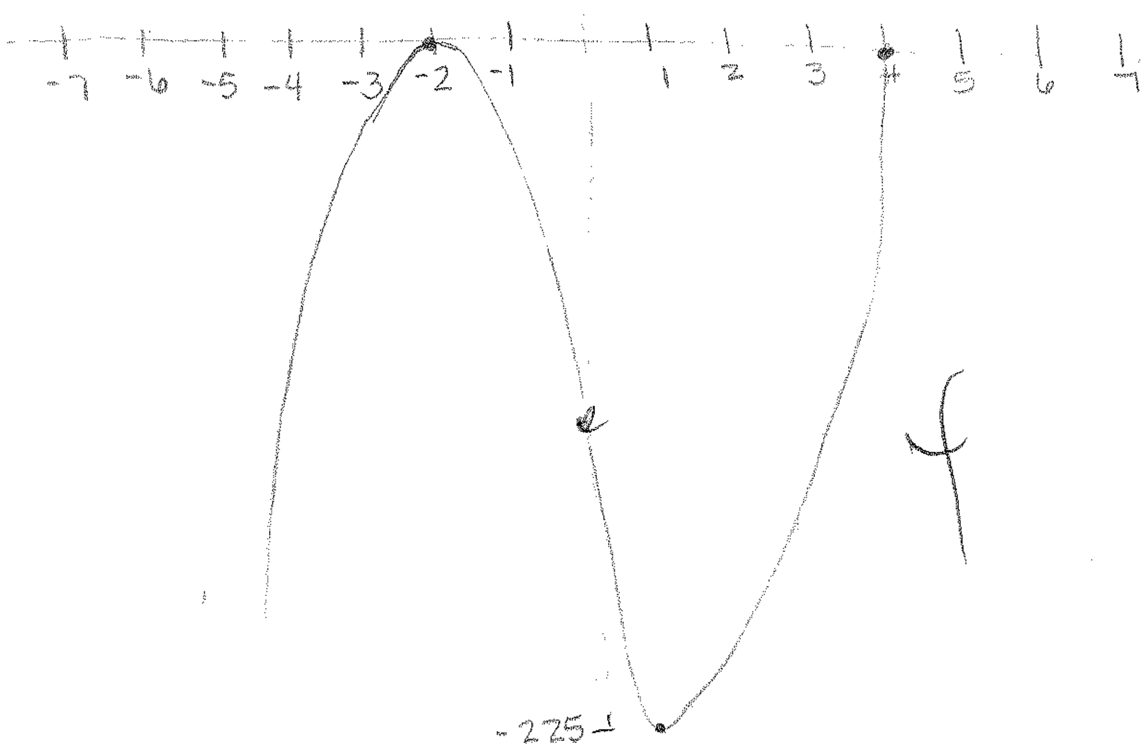
$(x+2)^2(x-4)(x^2-6x+13)$

3

b. (2 pts) Factor f over the COMPLEX number field. (All *linear* factors.).

$(x+2)^2(x-4)(x-3-2i)(x-3+2i)$

6. (5 pts) Now that you've factored it, I want you to sketch the graph of $f(x)=x^5-6x^4+x^3+56x^2-60x-208$, showing all intercepts. A *smooth* graph is the goal, here, not a graph that's a slave to the scale.



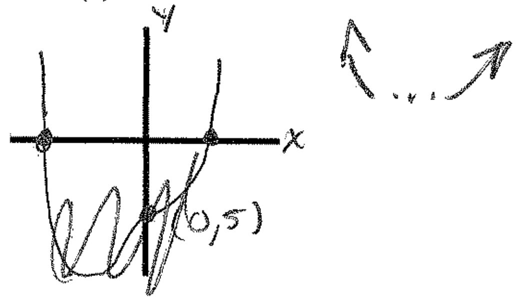
7

MAT 121-G11 – Fall, 2011 Test 3 Take-Home
Chapter 3 – 30 pts
Due Wednesday, October 26th

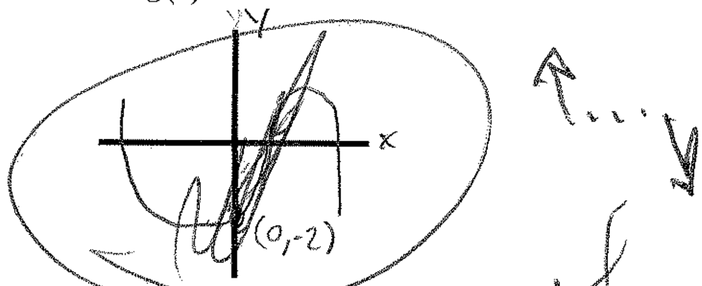
Name Enrique Ramirez $\frac{26}{30}$

1. (5 pts) For each of the following polynomials, draw the end behavior on the graph.

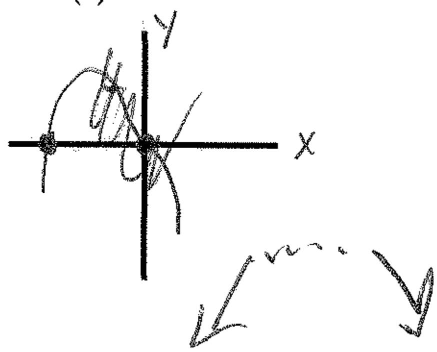
a. $p(x) = 5x^4 - 4x^3 + 2x - 5$



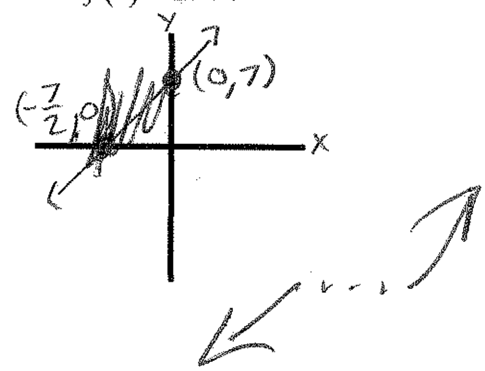
b. $g(x) = -5x^5 + 3x^4 - 5x^2 + 7x - 2$



c. $h(x) = -x^6 - 4x^3 + 2x^2 - 8x + 1$



d. $f(x) = 2x + 7$



Let $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$ for problems 2 - 6.

2. (5 pts) What does Descartes Rule of Signs tell you about this function?

There are a maximum of 5 zeros, 3 are positive zeros & 2 negative zeros

$f(-x) = -x^5 - 6x^4 - x^3 + 56x^2 + 60x - 208$

3

3. (5 pts) Use the Rational Zeros (Roots) Theorem to list the possible rational zeros of f.

P: $\pm 1, \pm 2, \pm 4, \pm 8, \pm 16, \pm 26, \pm 52, \pm 104, \pm 208$

q: ± 1

± 13

1	208
2	104
~~3~~	
4	52
~~5~~	
~~6~~	
8	26
16	13

11

4. (5 pts) Find all real and complex zeros of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, using the rational zero candidates you have from the previous problem. Put your work NEATLY in the space below. **This means doing your work on separate paper, organizing it, and transferring it to the space, below, after you've eliminated the bad guesses. No credit for sloppy work.**

$$\begin{array}{r|rrrrrr} -2 & 1 & -6 & 1 & 56 & -60 & -208 \\ & & -2 & 16 & -34 & -44 & 208 \\ \hline & 1 & -8 & 17 & 22 & -104 & 0 \end{array} \quad \boxed{(x+2)}$$

$$\begin{array}{r|rrrrr} 4 & 1 & -8 & 17 & 22 & -104 \\ & & 4 & -16 & 4 & 104 \\ \hline & 1 & -4 & 1 & 26 & 0 \end{array} \quad \boxed{(x-4)}$$

$$\begin{array}{r|rrrr} -2 & 1 & -4 & 1 & 26 \\ & & -2 & 12 & -26 \\ \hline & 1 & -6 & 13 & 0 \end{array} \quad \boxed{(x+2)}$$

5

$x^2 - 6x + 13$

a b c

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(13)}}{2(1)}$$

$$= \frac{6 \pm \sqrt{-16}}{2} = \frac{6 \pm 4i}{2} = 3 \pm 2i$$

$(x-(3+2i))(x-(3-2i))$ $i^2 = -1$

$(x-3-2i)(x-3+2i)$

$((x-3)^2 - 4i^2)$

$(x-3)(x-5) - 4i^2$

$x^2 - 6x + 9 - 4(-1)$

$\boxed{(x^2 - 6x + 13)}$

5

5. Now that you've done all the prep work, write f in factored form, in two ways:

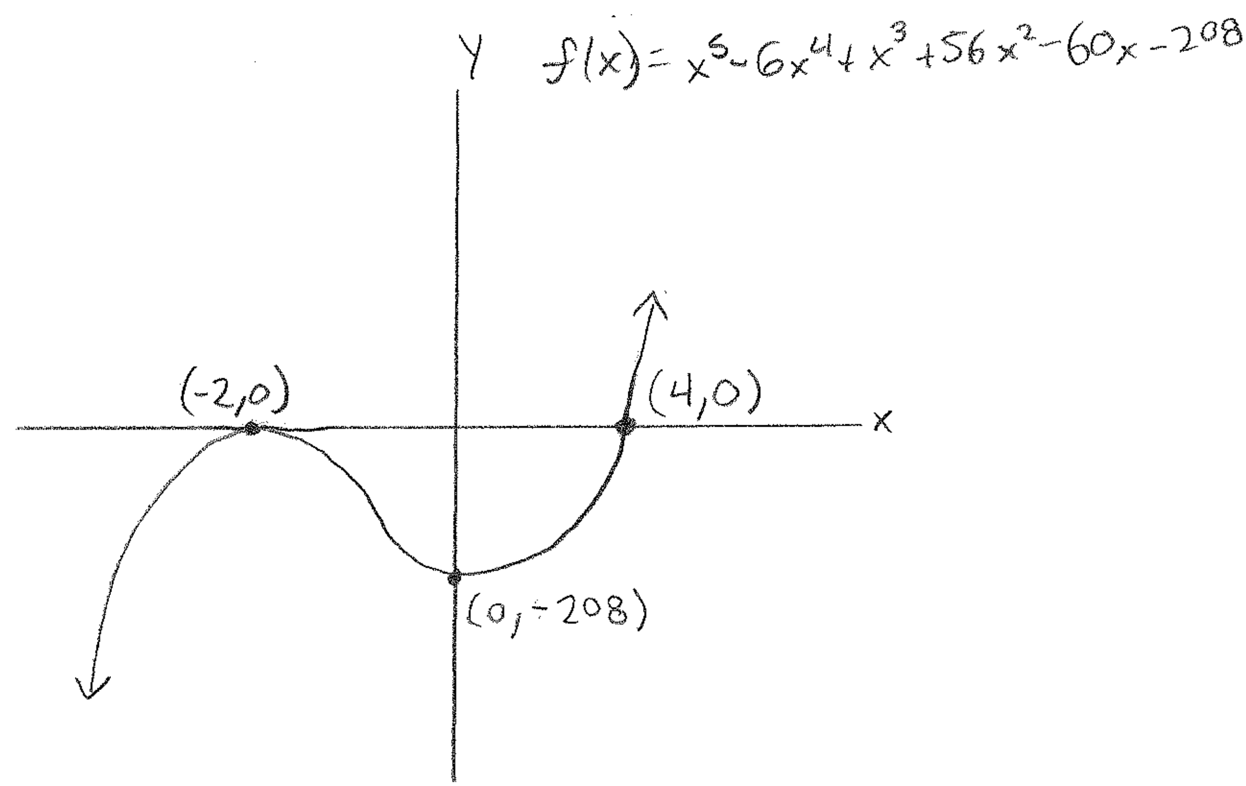
a. (3 pts) Factor f over the REAL number field (Involves an *irreducible quadratic* factor.).

$$f(x)=(x+2)(x+2)(x-4)(x^2-6x+13)$$

b. (2 pts) Factor f over the COMPLEX number field. (All *linear* factors.).

$$f(x)=(x+2)(x+2)(x-4)(x-3-2i)(x-3+2i)$$

6. (5 pts) Now that you've factored it, I want you to sketch the graph of $f(x)=x^5-6x^4+x^3+56x^2-60x-208$, showing all intercepts. A *smooth* graph is the goal, here, not a graph that's a slave to the scale.



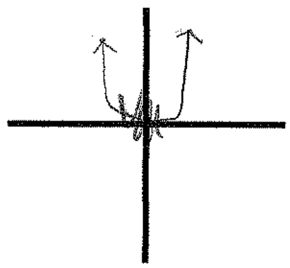
MAT 121-G11 – Fall, 2011 Test 3 Take-Home
Chapter 3 – 30 pts
Due Wednesday, October 26th

Name Ryan Dollerschell

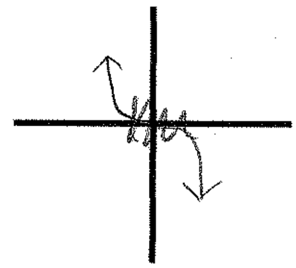
30/30

1. (5 pts) For each of the following polynomials, draw the end behavior on the graph.

a. $p(x) = 5x^4 - 4x^3 + 2x - 5$

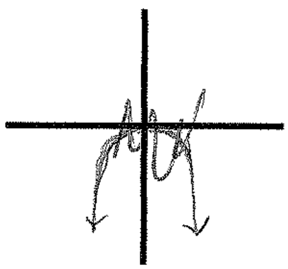


b. $g(x) = -5x^5 + 3x^4 - 5x^2 + 7x - 2$

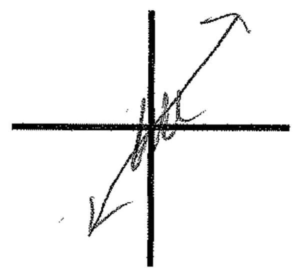


ok 5

c. $h(x) = -x^6 - 4x^3 + 2x^2 - 8x + 1$



d. $f(x) = 2x + 7$



Let $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$ for problems 2 - 6.

2. (5 pts) What does Descartes Rule of Signs tell you about this function?

There are 3 or 1 positive real zeros

& There are 2 or 0 negative real zeros

$f(-x) = -x^5 - 6x^4 - x^3 + 56x^2 + 60x - 208$

5

3. (5 pts) Use the Rational Zeros (Roots) Theorem to list the possible rational zeros of f.

$f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$

p: ±1, ±2, ±4, ±8, ±13, ±16, ±26, ±52, ±104, ±208

q: ±1

$\frac{p}{q}$, Possible zeros: ±1, ±2, ±4, ±8, ±13, ±16, ±26, ±52, ±104, ±208

5

4. (5 pts) Find all real and complex zeros of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, using the rational zero candidates you have from the previous problem. Put your work NEATLY in the space below. **This means doing your work on separate paper, organizing it, and transferring it to the space, below, after you've eliminated the bad guesses. No credit for sloppy work.**

$$\begin{array}{r|rrrrrr} -2 & 1 & -6 & 1 & 56 & -60 & -208 \\ & & -2 & 16 & -34 & -44 & 208 \\ \hline & 1 & -8 & 17 & 22 & -104 & 0 \end{array}$$

$(x+2)(x^4 - 8x^3 + 17x^2 + 22x - 104)$

$$\begin{array}{r|rrrrr} 4 & 1 & -8 & 17 & 22 & -104 \\ & & 4 & -16 & 4 & 104 \\ \hline & 1 & -4 & 1 & 26 & 0 \end{array}$$

$(x-4)(x+2)(x^3 - 4x^2 + x + 26)$

$$\begin{array}{r|rrrr} -2 & 1 & -4 & 1 & 26 \\ & & -2 & 12 & -26 \\ \hline & 1 & -6 & 13 & 0 \end{array}$$

$(x-4)(x+2)(x+2)(x^2 - 6x + 13)$

5

$b^2 - 4ac = (-6)^2 - 4(1)(13$

$= 36 - 52$

$= -16$

$x = \dfrac{-b \pm \sqrt{4ac}}{2a} = \dfrac{6 \pm \sqrt{-16}}{2} = \dfrac{\cancel{6}^{3} \pm \cancel{4}^{2} i}{\cancel{2}^{1}} = 3 \pm 2i$

$(x-4)(x+2)(x+2)(x - (3+2i))(x - (3-2i))$

$\therefore$ the zeros are: $4, -2, -2, 3+2i, 3-2i$

5

5. Now that you've done all the prep work, write f in factored form, in two ways:

   a. (3 pts) Factor f over the REAL number field (Involves an *irreducible quadratic* factor.).

   $(x-4)(x+2)(x+2)(x^2-6x+13)$

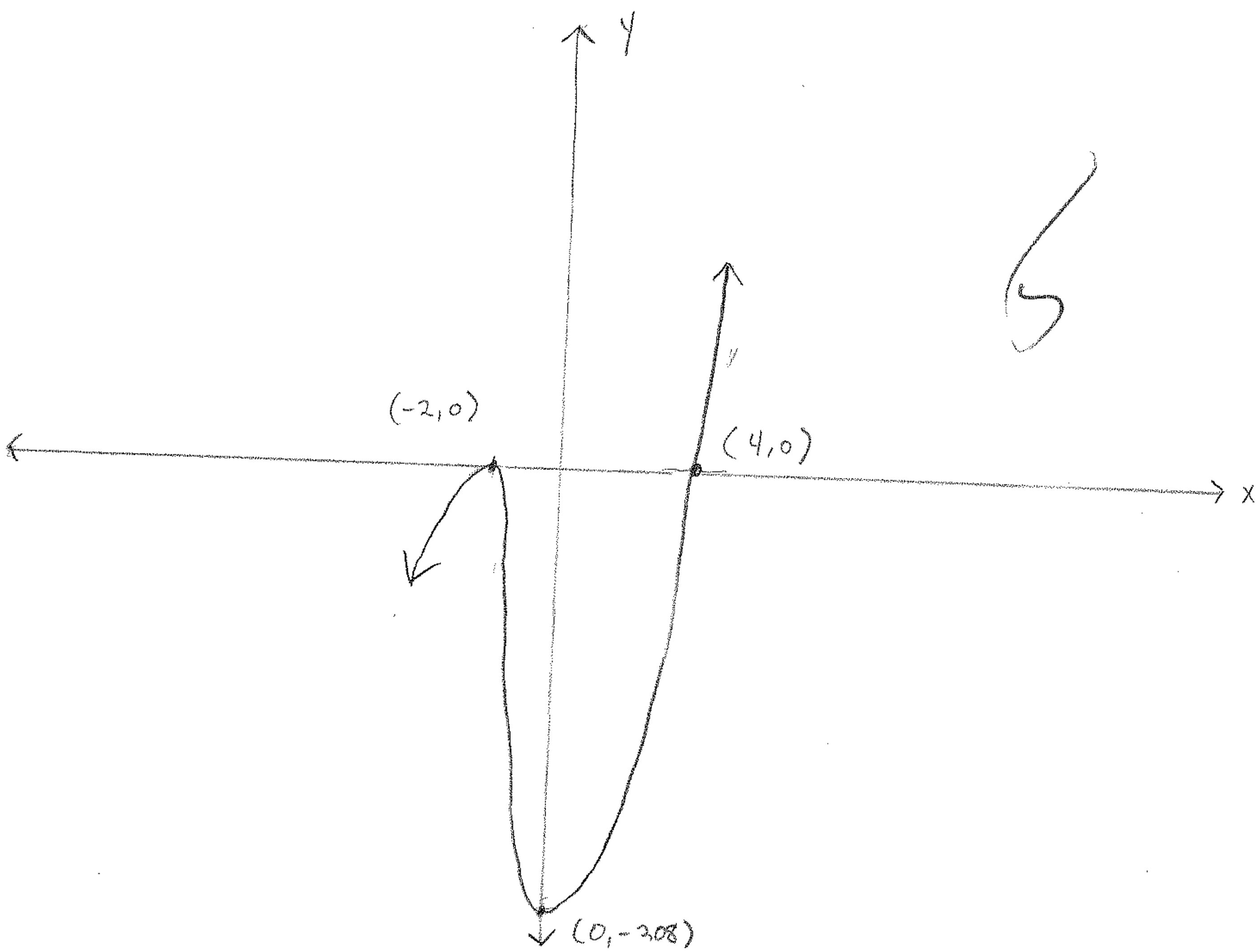
   4.5

   b. (2 pts) Factor f over the COMPLEX number field. (All *linear* factors.).

   $(x-4)(x+2)(x+2)(x-3x-2i)(x-3+2i)$

6. (5 pts) Now that you've factored it, I want you to sketch the graph of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, showing all intercepts. A *smooth* graph is the goal, here, not a graph that's a slave to the scale.

$f(0) = 0^5 - 6(0)^4 + 0^3 + 56(0)^2 - 60(0) - 208$
$= -208$



5

8

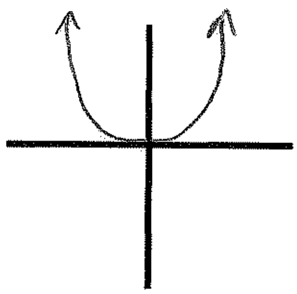
MAT 121-G11 – Fall, 2011 Test 3 Take-Home
Chapter 3 – 30 pts
Due Wednesday, October 26th

Name Danielle Harms

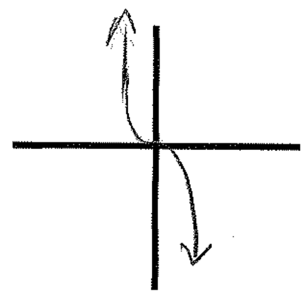
27/30

1. (5 pts) For each of the following polynomials, draw the end behavior on the graph.

a. $p(x) = 5x^4 - 4x^3 + 2x - 5$



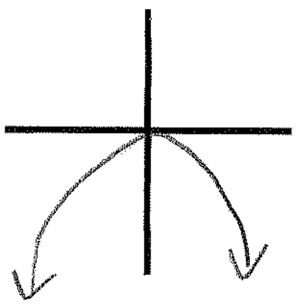
b. $g(x) = -5x^5 + 3x^4 - 5x^2 + 7x - 2$



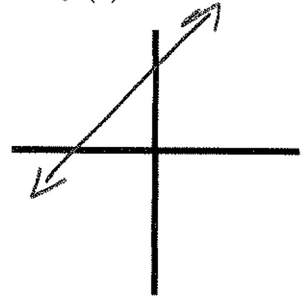
ok

5

c. $h(x) = -x^6 - 4x^3 + 2x^2 - 8x + 1$



d. $f(x) = 2x + 7$



Let $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$ for problems 2 - 6.

2. (5 pts) What does Descartes Rule of Signs tell you about this function?

3 positive real zero possibilities or 1

3

$f(-x) = (-x)^5 - 6(-x)^4 + (-x)^3 + 56(-x)^2 - 60(-x) - 208$

$= -x^5 - 6x^4 - x^3 + 56x^2 + 60x - 208$

2 negative zero possibilities or None

3. (5 pts) Use the Rational Zeros (Roots) Theorem to list the possible rational zeros of f.

$p = \pm 1, \pm 2, \pm 4, \pm 8, \pm 13, \pm 26, \pm 52, \pm 104, \pm 208$

$q = \pm 1$

$p/q = \pm 1, \pm 2, \pm 4, \pm 8, \pm 13, \pm 26, \pm 52, \pm 104, \pm 208, \pm 16$

4

2

4. (5 pts) Find all real and complex zeros of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, using the rational zero candidates you have from the previous problem. Put your work NEATLY in the space below. **This means doing your work on separate paper, organizing it, and transferring it to the space, below, after you've eliminated the bad guesses. No credit for sloppy work.**

x^5

$$\begin{array}{r|rrrrrr} 4 & 1 & -6 & 1 & 56 & -60 & -208 \\ & & 4 & -8 & -28 & 112 & +208 \\ \hline & 1 & -2 & -7 & 28 & 52 & 0 \end{array}$$

factor: $(x-4)$

x^4

$$\begin{array}{r|rrrrr} -2 & 1 & -2 & -7 & 28 & 52 \\ & & -2 & 8 & -2 & -52 \\ \hline & 1 & -4 & 1 & 26 & 0 \end{array}$$

factor: $(x+2)$

x^3

$$\begin{array}{r|rrrr} -2 & 1 & -4 & 1 & 26 \\ & & -2 & 12 & -26 \\ \hline & 1 & -6 & 13 & 0 \end{array}$$

factor: $(x+2)$

$$\boxed{\text{factored} = (x-4)(x+2)^2(x^2-6x+13)}$$

$x^2 - 6x + 13$

$$x = \frac{-(-6) \pm \sqrt{6^2 - 4(1)(13)}}{2(1)}$$

$$x = \frac{6 \pm \sqrt{36-52}}{2}$$

$$x = \frac{6 \pm \sqrt{-16}}{2}$$

$$x = \frac{6 \pm 4i}{2}$$

$$x = 3 \pm 2i$$

complex $= (x - 3 + 2i)(x + 3 - 2i)$

5

5. Now that you've done all the prep work, write f in factored form, in two ways:

a. (3 pts) Factor f over the REAL number field (Involves an *irreducible quadratic* factor.).

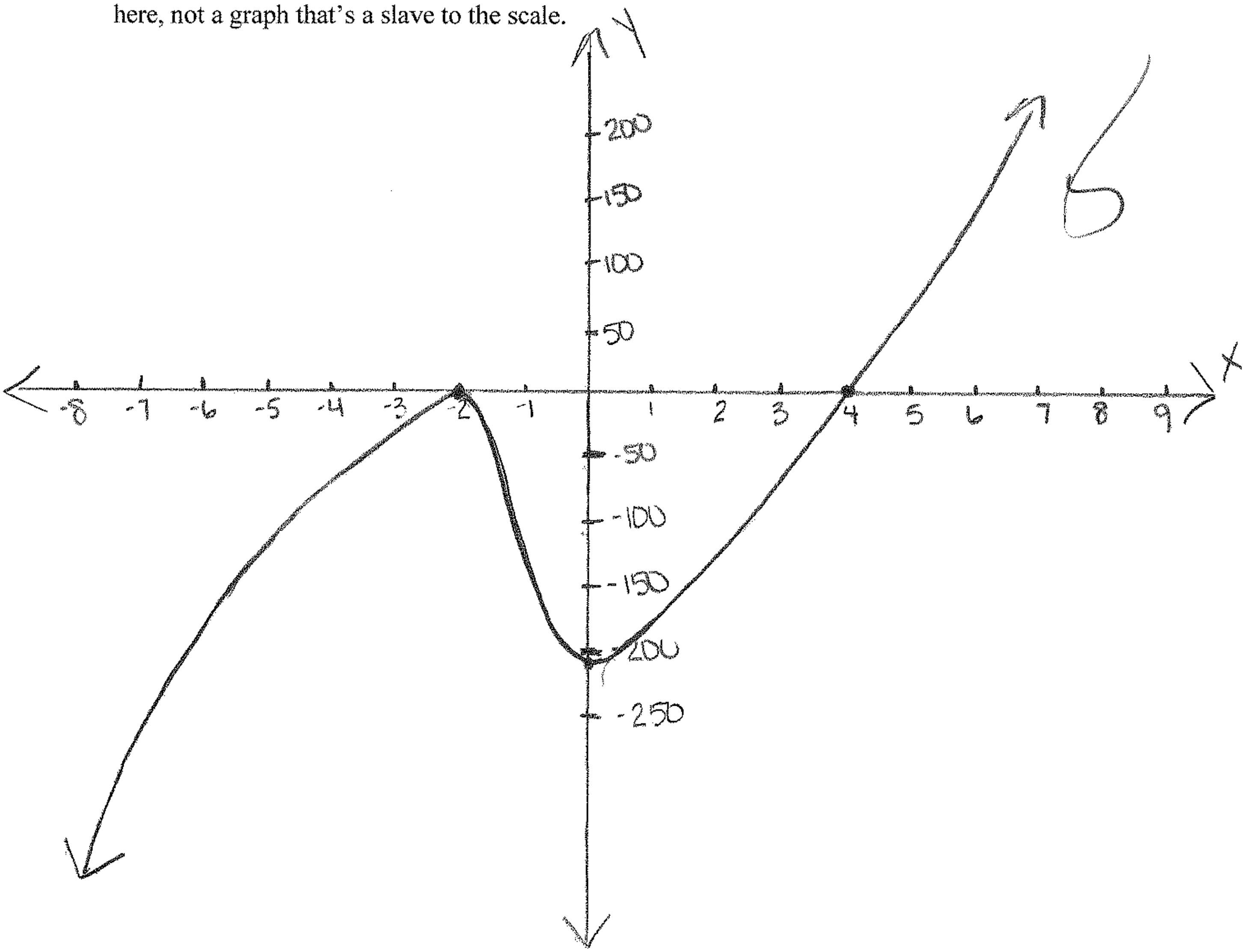
$(x-4)(x+2)^2(x^2-6x+13)$

b. (2 pts) Factor f over the COMPLEX number field. (All *linear* factors.).

$(x-4)(x+2)^2(x-3+2i)(x-3-2i)$

5

6. (5 pts) Now that you've factored it, I want you to sketch the graph of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, showing all intercepts. A *smooth* graph is the goal, here, not a graph that's a slave to the scale.



5

$x = -2, 4$
touch, cross

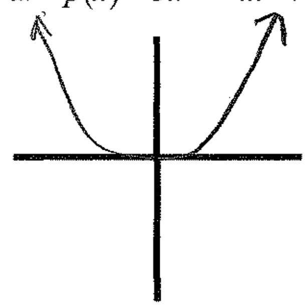
y-intercept = $(0, -208)$

10

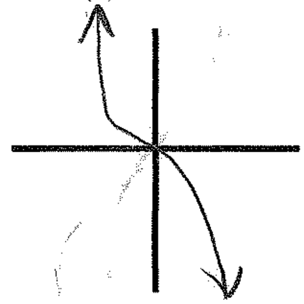
MAT 121-G11 – Fall, 2011 Test 3 Take-Home
Chapter 3 – 30 pts Name Ross Stump p $\frac{27}{30}$
Due Wednesday, October 26th

1. (5 pts) For each of the following polynomials, draw the end behavior on the graph.

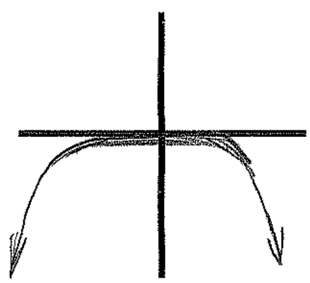
a. $p(x) = 5x^4 - 4x^3 + 2x - 5$



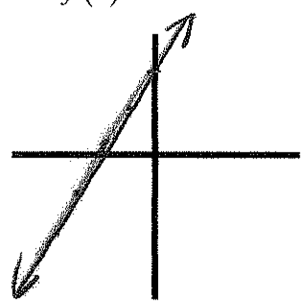
b. $g(x) = -5x^5 + 3x^4 - 5x^2 + 7x - 2$



c. $h(x) = -x^6 - 4x^3 + 2x^2 - 8x + 1$



d. $f(x) = 2x + 7$



ok 5

Let $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$ for problems 2 - 6.

2. (5 pts) What does Descartes Rule of Signs tell you about this function?

It says that there are 3 or 1 positive real solutions. There is two or none negative zeros to this function because there are two sign changes in $f(-x)$.

4

3. (5 pts) Use the Rational Zeros (Roots) Theorem to list the possible rational zeros of f.

$\frac{-208}{1}$ $\pm 1, \pm 2, \pm 4 \pm 8, \pm 13, \pm 16, \pm 26, \pm 52, \pm 104, \pm 208$ 5

14

4. (5 pts) Find all real and complex zeros of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, using the rational zero candidates you have from the previous problem. Put your work NEATLY in the space below. **This means doing your work on separate paper, organizing it, and transferring it to the space, below, after you've eliminated the bad guesses. No credit for sloppy work.**

4	1	-6	1	56	-60	-208
		4	-8	-28	112	208
	1	-2	-7	28	52	0
-2		-2	+8	-2	-52	0
	1	-4	1	26	0	0
-2		-2	12	-26	0	0
	1	-6	13	0	0	0

zeros

rational factors : -4, $+2$, $+2$

remaining quadratic $= 1x^2 - 6x + 13$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{6 \pm \sqrt{36 - 52}}{2}$$

$$\frac{6 \pm \sqrt{16}\, i}{2} = \frac{6 \pm \sqrt{-16}}{2}$$

3

$$\frac{6 \pm 4i}{2} = 3 \pm 2i$$

$\frac{3 \pm 4i}{}$ are factors.

The two divides all the numerator

$$f(x) = (x-4)(x+2)^2(x-(3+4i))(x-(3-4i))$$

5. Now that you've done all the prep work, write f in factored form, in two ways:

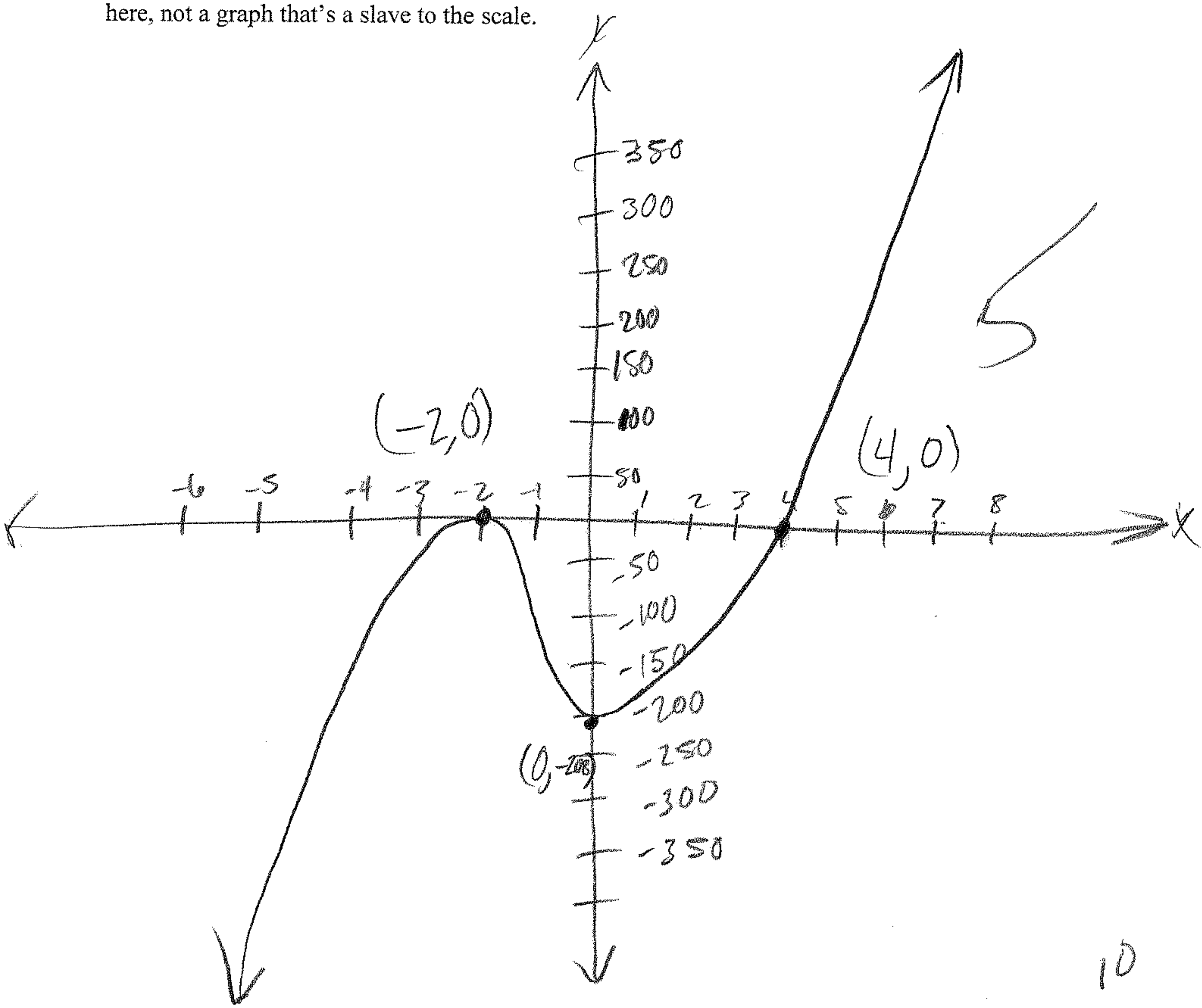
a. (3 pts) Factor f over the REAL number field (Involves an *irreducible quadratic* factor.).

$$f(x)=(x-4)(x+2)^2(x^2-6x+13)$$

b. (2 pts) Factor f over the COMPLEX number field. (All *linear* factors.). ok 5

$$f(x)=(x-4)(x+2)^2(x-(3+4i))(x-(3-4i))$$

6. (5 pts) Now that you've factored it, I want you to sketch the graph of $f(x)=x^5-6x^4+x^3+56x^2-60x-208$, showing all intercepts. A *smooth* graph is the goal, here, not a graph that's a slave to the scale.



5

10

29/30

P

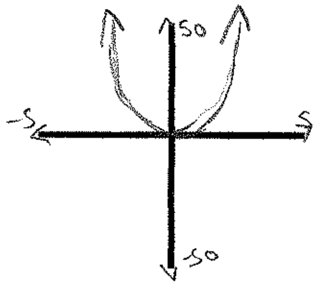
I sure hope not, because then this is REALLY late → MAT 121-G11 – Fall, 2011   Test 3 Take-Home   Name Paige Johnson

Chapter 3 – 30 pts

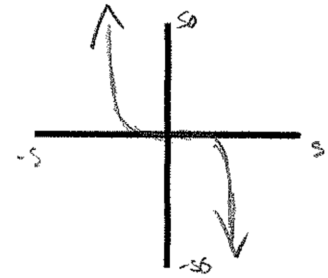
Due Wednesday, October 26th

1. (5 pts) For each of the following polynomials, draw the end behavior on the graph.

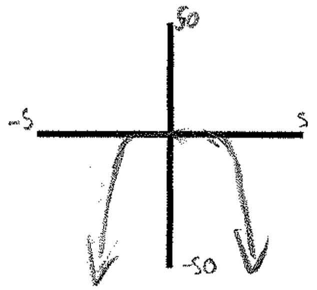
a. $p(x) = 5x^4 - 4x^3 + 2x - 5$



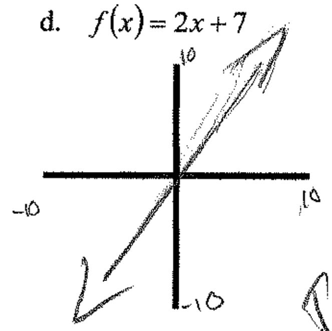
b. $g(x) = -5x^5 + 3x^4 - 5x^2 + 7x - 2$



c. $h(x) = -x^6 - 4x^3 + 2x^2 - 8x + 1$



d. $f(x) = 2x + 7$



OR 5

Let $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$ for problems 2 - 6.

2. (5 pts) What does Descartes Rule of Signs tell you about this function?

First we conclude that there are either 3 or 1 positive zeros of the function. Then we take f(-x) and conclude that there are $\boxed{\text{two negative zeros. So there are three positive and two negative.}}$

Two or zero negative zeros. There MIGHT be nonreal zeros

4

3. (5 pts) Use the Rational Zeros (Roots) Theorem to list the possible rational zeros of f.

±1, ±2, ±4, ±8, ±13, ±16, ±26, ±52, ±104, ±208

+ ±1

OR 5

1, -1, 2, -2, 4, -4, 8, -8, 13, -13, 16, -16, 26, -26, 52, -52, 104, -104, 208, -208

14

4. (5 pts) Find all real and complex zeros of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, using the rational zero candidates you have from the previous problem. Put your work NEATLY in the space below. **This means doing your work on separate paper, organizing it, and transferring it to the space, below, after you've eliminated the bad guesses. No credit for sloppy work.**

4	1	-6	1	56	-60	-208
		4	-8	-28	112	208
-2	1	-2	-7	28	52	0
		-2	8	-2	-52	
-2	1	-4	1	26	0	
		-2	12	-26		
	1	-6	13	0		

$x^2 - 6x + 13$

$$x = \frac{6 \pm \sqrt{(-6)^2 - 4(1)(13)}}{2}$$

$$x = \frac{6 \pm \sqrt{-16}}{2}$$

$$x = \frac{6 \pm 4i}{2} \qquad x = 3 \pm 2i$$

zeros of $f(x)$ are:
4, −2 (multiplicity of 2)
$3+2i$, $3-2i$

5

5

5. Now that you've done all the prep work, write f in factored form, in two ways:

a. (3 pts) Factor f over the REAL number field (Involves an *irreducible quadratic* factor.).

$$f(x) = (x-4)(x+2)^2(x^2-6x+13)$$

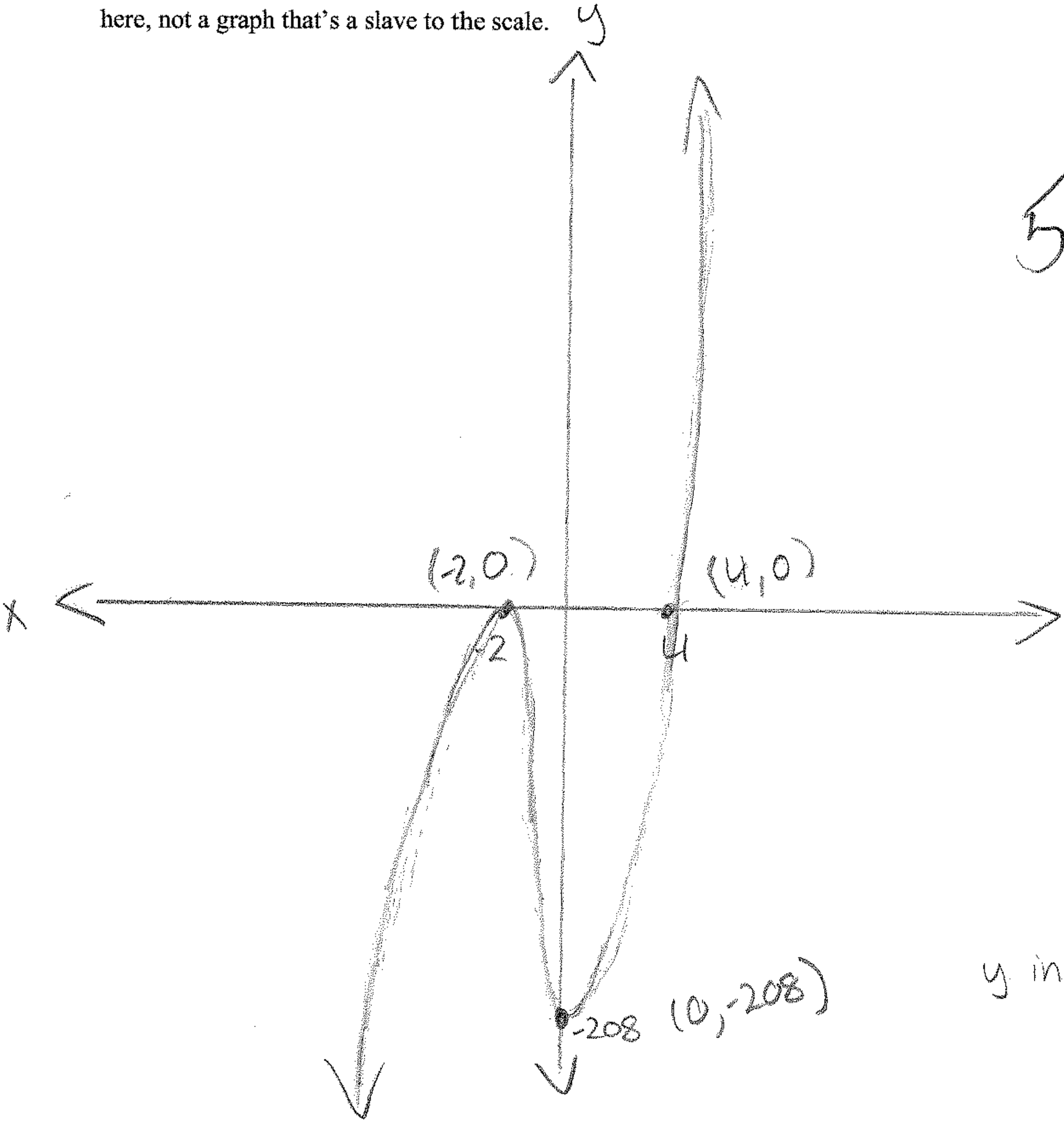
5

b. (2 pts) Factor f over the COMPLEX number field. (All *linear* factors.).

$$f(x) = (x-4)(x+2)^2[x-(3+2i)][x-(3-2i)]$$

6. (5 pts) Now that you've factored it, I want you to sketch the graph of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, showing all intercepts. A *smooth* graph is the goal, here, not a graph that's a slave to the scale.

5



y intercept = -208

10

MAT 121-G11 – Fall, 2011 Test 3 Take-Home

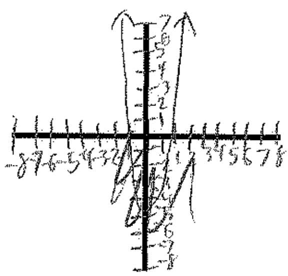
Chapter 3 – 30 pts

Due Wednesday, October 26th

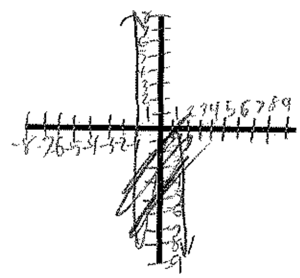
Name Bill P $\frac{27}{30}$

1. (5 pts) For each of the following polynomials, draw the end behavior on the graph.

a. $p(x) = 5x^4 - 4x^3 + 2x - 5$

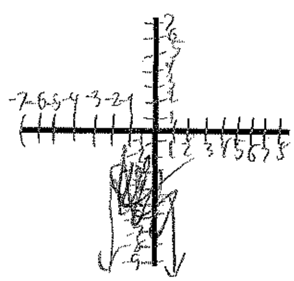


b. $g(x) = -5x^5 + 3x^4 - 5x^2 + 7x - 2$

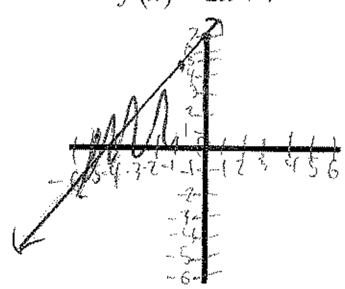


4

c. $h(x) = -x^6 - 4x^3 + 2x^2 - 8x + 1$



d. $f(x) = 2x + 7$



Let $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$ for problems 2 - 6.

2. (5 pts) What does Descartes Rule of Signs tell you about this function?

There is a degree of 5.
There are 3 or 1 positive zeros
There are 2 or 0 negative zeros

5

3. (5 pts) Use the Rational Zeros (Roots) Theorem to list the possible rational zeros of f.

$\pm 1, \pm 2, \pm 4, \pm 8, \pm 13, \pm 16, \pm 26, \pm 52, \pm 104, \pm 208$

5

4. (5 pts) Find all real and complex zeros of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, using the rational zero candidates you have from the previous problem. Put your work NEATLY in the space below. **This means doing your work on separate paper, organizing it, and transferring it to the space, below, after you've eliminated the bad guesses. No credit for sloppy work.**

$$\begin{array}{r|rrrrrr} -2 & 1 & -6 & 1 & 56 & -60 & -208 \\ & & -2 & 16 & -34 & -44 & 208 \\ \hline & 1 & -8 & 17 & 22 & -104 & 0 \end{array}$$

$(x+2)(x^4-8x^3+17x^2+22x-104)$

$$\begin{array}{r|rrrrr} 4 & 1 & -8 & 17 & 22 & -104 \\ & & 4 & -16 & 4 & 104 \\ \hline & 1 & -4 & 1 & 26 & 0 \end{array}$$

$(x+2)(x-4)(x^3-4x^2+x+26)$

$$\begin{array}{r|rrrr} -2 & 1 & -4 & 1 & 26 \\ & & -2 & 12 & -26 \\ \hline & 1 & -6 & 13 & 0 \end{array}$$

$(x+2)(x-4)(x+2)(x^2-6x+13)$

$(x+2)(x-4)(x+2)(x+2i+3)(x-2i+3)$

$x^2-6x+13=0$
$-13\ -13$
$x^2-6x=-13$
$\frac{6}{2}=(3)^2=9$
$x^2-6x+9=-13+9$
$\sqrt{(x-3)^2}=\pm\sqrt{-4}$
$x-3=\pm 2i$
$+3\ \ +3$
$x=\pm 2i+3$

$x+2=0$
$-2\ -2$
$x=-2$

$x-4=0$
$+4\ +4$
$x=4$

$x-2=0$
$+2\ +2$
$x=2$

3

$2i+3=0$
$-3\ -3$
$2i=-3$
$\frac{2i}{2}=\frac{-3}{2}$
$i=-\frac{3}{2}$

$-2i+3=0$
$-3\ -3$
$-2i=-3$
$-2\ -2$
$i=\frac{3}{2}$

$\boxed{\{-2, 4, 2, -\frac{3}{2}, \frac{3}{2}\}}$

5. Now that you've done all the prep work, write f in factored form, in two ways:

a. (3 pts) Factor f over the REAL number field (Involves an *irreducible quadratic* factor.).

$$(x+2)^2(x-4)(x^2-6x+13)$$

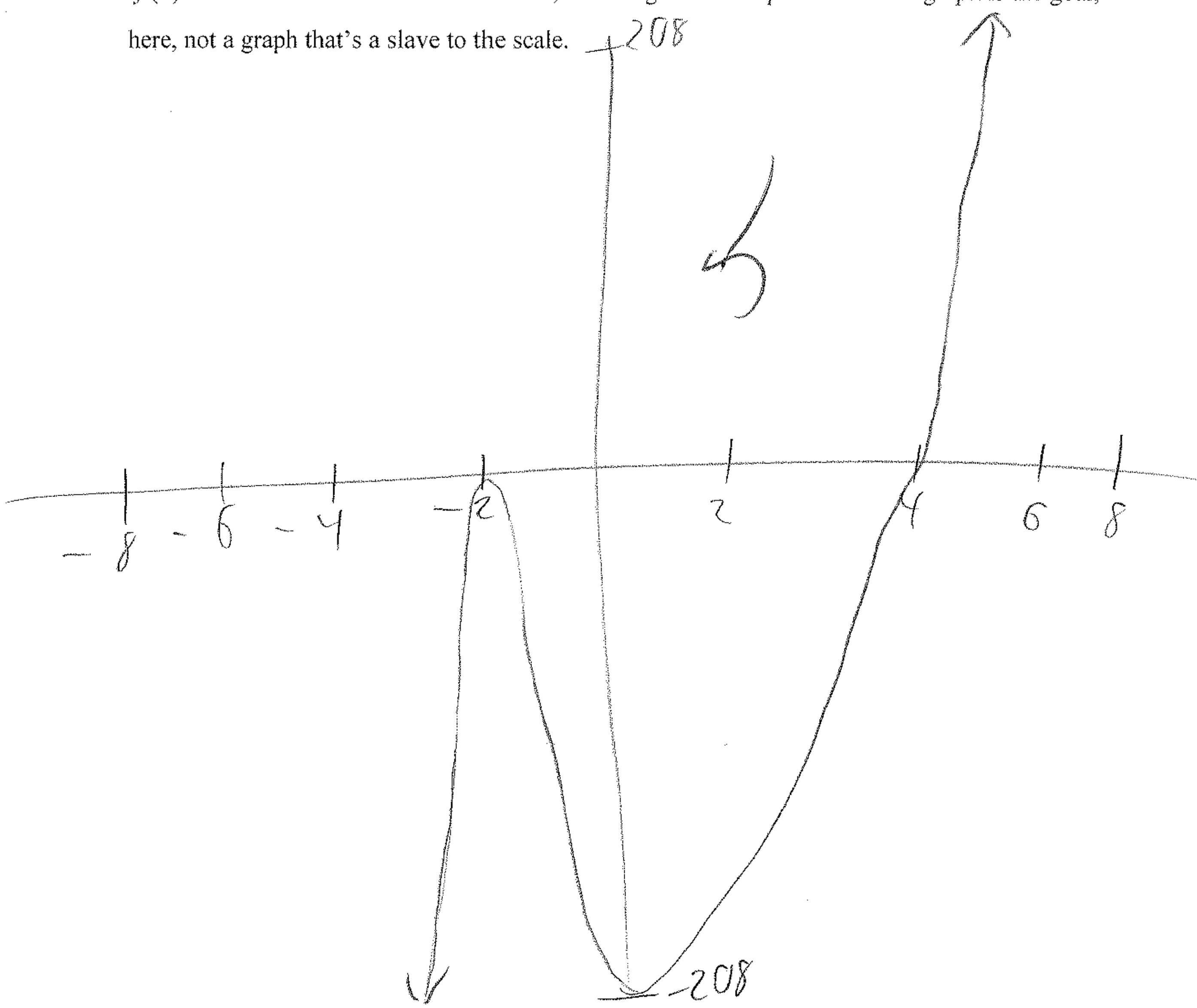
3

b. (2 pts) Factor f over the COMPLEX number field. (All *linear* factors.).

$$(x+2)^2(x-4)[x-(2i+3)][x-(-2i+3)]$$

2

6. (5 pts) Now that you've factored it, I want you to sketch the graph of $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$, showing all intercepts. A *smooth* graph is the goal, here, not a graph that's a slave to the scale.



50

4) $-2 \,|\, 1 \; -6 \; +1 \; +56 \; -60 \; -208$
$\quad -2 \quad 16 \quad -34 \quad -49 \quad 208$
$1x^4 \; -8x^3 \; 17x^2 \; 22x \; -104 \quad 0$

$(x+2)(x^4-8x^3+17x^2+22x-10$

$-4 \,|\, 1 \; -8 \; +17 \; +22 \; -104$
$\quad -4 \quad 48 \quad -300 \quad +1112$
$1 \; -12 \; 75 \; -278 \; 1008$

$4 \,|\, 1 \; -8 \; 17 \; 22 \; -104$
$\quad 4 \quad -16 \quad 4 \quad 104$
$1 \; -4 \; 1 \; 26 \quad 0$

$8 \,|\, 1 \; -4 \; +1 \; +26$
$\quad 8 \quad 32$
$1 \quad 4 \quad 33$

$(x+2)(x-4)(x^3-4x^2+x+26)$

$(x+2)(x-2)(x-4)(x^2-6x+13)$

$(x+2)(x-2)(x-4)(x-6)(x+13)$

$(x^2-4)(x-4) = (x^3-4x^2-4x+16)(x-6) = x^4+24x^2+24x-96-6x^3+4x^3+16x$

$(x^4-2x^3+28x^2+40x-96)(x+13)$

$x^5-2x^4+28x^3+40x^2-96x+13x^4-26x^3+364x^2+520x-1248$

$-8 \,|\, 1 \; -4 \; +1 \; +26$
$\quad -8 \quad 96 \quad -776$
$1 \; -12 \; 97 \; -750$

$x^2-6x+13=0$
$\quad -13 \; -13$

$x(x-6) = -13$

$x = -13$
$+13 \quad +13$

$x-6=0$
$+6 \; +6$
$x=6$

$(x-13)(x-\;)$

$-13 \,|\, 1 \; -4 \; +1 \; +26$
$\quad -13 \quad 221 \quad -2886$
$1 \; -17 \; 222 \; -2860$

$13 \,|\, 1 \; -4 \; +1 \; +26$
$\quad 13 \quad 117 \quad 1534$
$1 \quad 9 \quad 118 \quad 1560$

$-4 \,|\, 1 \; -6 \; 13$
$\quad -4$
$1 \; -10 \; 13$

$-8 \,|\, 1 \; -6 \; 13$
$\quad -8$
$1 \; -14$

$26 \,|\, 1 \; -6 \; 13$
$\quad 26 \quad 520$
$1 \quad 20 \quad 533$

$2 \,|\, 1 \; -4 \; +1 \; +26$
$\quad 2 \quad -4 \quad -6$
$1 \; -2 \; -3 \quad 20$

$4 \,|\, 1 \; -6 \; 13$
$\quad 4 \quad -8$
$1 \; -2 \quad 5$

$13 \,|\, 1 \; -6 \; 13$
$\quad 13$
$1 \quad 7$

$-4 \,|\, 1 \; -4 \; +1 \; +26$
$\quad -4 \quad 0 \quad 0$
$1 \quad 0 \quad 0 \quad 26$

$-2 \,|\, 1 \; -4 \; +1 \; +26$
$\quad -2 \quad 12 \quad -26$
$1 \; -6 \; 13 \quad 0$

$-1 \,|\, 1 \; -6 \; 13$
$\quad -1 \quad 7$
$1 \; -7 \quad 20$

$1 \,|\, 1 \; -6 \; 13$
$\quad 1 \quad -5$
$1 \; -5 \quad 8$

6) $f(x) = x^5 - 6x^4 + x^3 + 56x^2 - 60x - 208$

$f(1) = 1 - 6 + 1 + 56 - 60 - 208$

$f(1) = -5 + 56 - 60 - 208$

$f(1) = -9 - 208$

$f(1) = -217$

$f(-3) = (-3)^5 - 6(3)^4 + (-3)^3 + 56(-3)^2 - 60(-3) - 208$

$f(-3) = -243 - 486 - 27 + 494 + 180 - 208$

$f(-3) = -729 - 27 + 494 + 180 - 208$

$f(-3) = -756 + 494 + 180 - 208$

$f(-3) = -312 + 180 - 208$

$f(-3) = -132 - 208$

$f(-3) = -340$

$81 \times 3 = 243$

$81 \times 6 = 486$

$486 + 243 = 729$

$729 + 27 = 756$

$56 \times 9 = 494$

$756 - 494 = -312$

$-312 + 180 = -132$

$-132 - 208 = -340$