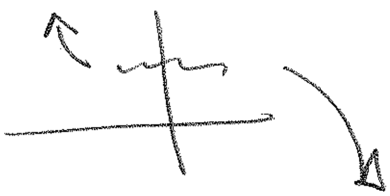
121 E3 TAKE-HOME & WRITING PROJECT #3 35 pts

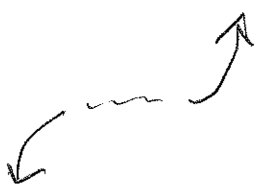
① A zero of a polynomial $P(x)$ is a value of x such that $P(x)=0$. A real zero corresponds to an x-intercept; whereas a nonreal, complex zero does not. x-intcpts

② (a) $f(x) = -4x^5 + \cdots$



(b) $g(x) = 3x^4 + \cdots$

(c) $h(x) = 4x^3 + \cdots$



(d) $p(x) = -2x^6$

③ $f(x) = x^5 - 3x^4 - 4x^3 + 28x^2 - 37x + 15$

Descartes: 4, 2, 0 positive; 1 negative.

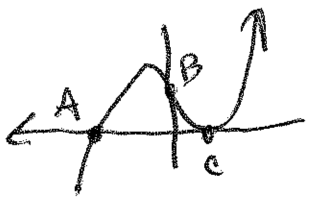
$f(-x) = -x^5 - 3x^4 + 4x^3 + 28x^2 + 37x + 5$

④ Rational: $\frac{p}{q}$: $\pm 1, \pm 3, \pm 5, \pm 15$

⑤ 1, 1, −3 → nonreal: $x = 2 \pm i$

⑥ y-int is $(0, f(0)) = (0, 15)$

⑦



$A = (-3, 0)$
$B = (0, 15)$
$C = (1, 0)$

⑧ Support graph

⑨ Further methods

⑩ $(x-1)^2(x+3)(x-(2+i))(x-(2-i))$

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5

$$
\begin{array}{r|rrrrrr}
1 & 1 & -3 & -4 & +28 & -37 & 15 \\
 & & 1 & -2 & -6 & 22 & -15 \\
\hline
1 & 1 & -2 & -6 & 22 & -15 & \\
 & & 1 & -1 & -7 & 15 & \\
\hline
-3 & 1 & -1 & -7 & 15 & 0 & \\
 & & -3 & 12 & -15 & & \\
\hline
 & 1 & -4 & 5 & & &
\end{array}
$$

$x^2 - 4x + 5 = 0$

$a = 1,\ b = -4,\ c = 5$

$b^2 - 4ac = (-4)^2 - 4(1)(5)$

$= 16 - 20$

$= -4$

$x = \dfrac{4 \pm \sqrt{-4}}{2}$

$= \dfrac{4 \pm 2i}{2} = 2 \pm i$

$x = 1$, multiplicity $= 2$

$x = 3$, " $= 1$

$x = 2 \pm i$, multiplicity $= 1$

6 y-int : $(0, f(0)) = (0, 15)$

by grabbing the constant term

7 SKETCH :

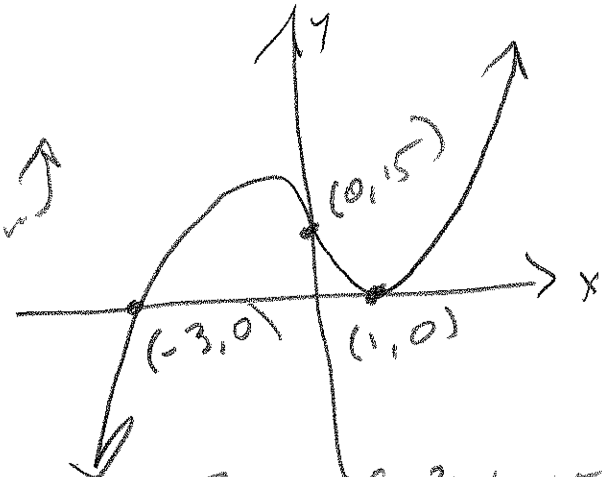
zeros ✓

multiplicities (touch/cross)

y-int.

End Behavior:

x5



8 FACTORED : $f(x) = (x-1)^2(x+3)(x^2-4x+5)$

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