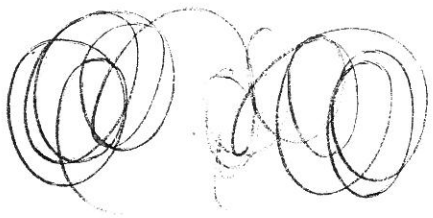
MAT 121
100 Points

Test 1, Spring, 2017
Covers Chapter 1

Name KEY

Find all real or imaginary solutions, #s 1 – 4.

1. (10 pts) $3x+12=7x-5$
2. (5 pts) $\frac{2}{3}x-\frac{1}{5}=\frac{3}{4}$
3. (5 pts) $7x^2=5$
4. (5 pts) $9x^2+6x-1=0$ (Leave your answer in simplified radical form.)



#s 5 – 7. Compute the discriminant for the following equations. Tell me what it says about the solutions of the equations, *without solving the equations*. How many distinct solutions, how many real zeros. If you can predict rational solutions, that's worth some extra points.

5. (5 pts) $6x^2-15x-156=0$
6. (5 pts) $4x^2-8x+13=0$
7. (5 pts) $49x^2+28x+4=0$

Solve by factoring: You can use a "cheat," so long as you show understanding of the connection between solutions and factors.

8. (10 pts) $x^2-7x+12=0$
9. (5 pts) $6x^2-15x-156=0$

Solve #s 10 and 11 by completing the square.

10. (5 pts) $x^2-6x+12=0$
11. (5 pts) $3x^2-4x-11=0$

Now for lines:

12. Find an equation in point-slope form through the point $(-2,3)$ of the line that is…
    a. (5 pts) … parallel to $y=5x+177$
    b. (5 pts) … perpendicular to $y=5x+177$
13. Sketch the graphs of the two lines on the same set of axes:
    a. (5 pts) $x=-3$
    b. (5 pts) $y=5$
14. Sketch the graph of $2x+3y=6$. I'll know if you've been paying attention by the features you include and the features you don't waste our time on.
15. Solve the absolute value inequalities:
    a. (10 pts) $|3x+5|>7$
    b. (5 pts) $|-2x+3|\le 7$
    c. (5 pts) $|3x+5|+7>5$
    d. (5 pts) $|-2x+3|+6<3$

16. (5 pts) SET UP THE FOLLOWING WORD PROBLEM. Do not solve.
    How much 44% alcohol solution must be added to 5 gallons of 75% alcohol solution to obtain a mixture that is 60% alcohol?

17. (5 pts) SET UP THE FOLLOWING WORD PROBLEM. Do not solve.
Tamara can do a job in 5 hours that it takes Bill 7 hours to finish. How long does it take them to finish the job, if they work together?

BONUS SECTION:

18. (5 pts) Suppose in the previous problem, Tamara thinks he such hot stuff that she starts work 1 hour late, and *then* joins Bill and they work together the rest of the way. How many hours do each of them work? I want the *solution*, here. Leave it as a fraction.

19. (5 pts) Sketch the graph of $y = 12x - 7$. I expect to see x- and y-intercepts.
20. (5 pts) Re-write the function $f(x) = x^2 - 6x + 12$ in the form $f(x) = a(x-h)^2 + k$.
21. (5 pts) Find all real and non-real solutions to the equation $x^4 - 7x^2 + 12 = 0$.

121 TEST 1 SPRING, 2017

(1) (10 pts) $3x+12 = 7x-5$

$-4x = -17$

$\boxed{x = \frac{17}{4}}$

(2) $\frac{2}{3}x - \frac{1}{5} = \frac{3}{4}$ LCD = 2, 2, 3, 5

$\frac{2x}{3}\cdot\frac{20}{20} - \frac{1}{5}\cdot\frac{12}{12} = \frac{3}{4}\cdot\frac{15}{15}$

$\frac{40x-12}{LCD} = \frac{45}{LCD}$

$40x - 12 = 45$

$40x = 57$

$\boxed{x = \frac{57}{40}}$

(3) $7x^2 = 5$

$x^2 = \frac{5}{7}$

$x = \pm\sqrt{\frac{5}{7}} = \pm\frac{\sqrt{5}\sqrt{7}}{\sqrt{7}\sqrt{7}} = \boxed{\pm\frac{\sqrt{35}}{7} = x}$

121 T1

(4) $9x^2 + 6x - 1 = 0$

$a=9,\ b=6,\ c=-1$

$b^2-4ac = 6^2-4(9)(-1)$

$= 36+36$

$= 72$

$\sqrt{72} = 6\sqrt{2}$

$x = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$

$= \dfrac{-6 \pm 6\sqrt{2}}{2(9)} = \dfrac{-6(1 \pm \sqrt{2})}{18} = \boxed{\dfrac{-1 \pm \sqrt{2}}{3}}$

≈ 1.380711875

$\approx -.8047378541$

$2\,|\,72$
$2\,|\,36$
$2\,|\,18$
$3\,|\,9$
3

$x^2 + \frac{2}{3}x = \frac{1}{9}$

$x^2 + \frac{2}{3}x + \left(\frac{1}{3}\right)^2 = \frac{1}{9} + \frac{1}{9}$

$\left(x+\frac{1}{3}\right)^2 = \frac{2}{9}$

$x + \frac{1}{3} = \pm\frac{\sqrt{2}}{3}$

$x = \frac{-1 \pm \sqrt{2}}{3}$

(5) $6x^2 - 15x - 156 = 0$

$a=6,\ b=-15,\ c=-156$

$b^2-4ac = (-15)^2-4(6)(-156)$

$= 225 + 3744$

$= 3969 = 63^2 \Rightarrow$ 2 real (RATIONAL!) solns

(6) $4x^2 - 8x + 13 = 0$

$a=4\ \ b=-8,\ c=13$

$b^2-4ac = (-8)^2-4(4)(13)$

$= 64 - 208$

$= -144 \Rightarrow$ 2 nonreal solns

121 T1

(7) $49x^2+28x+4=0$

$a=49,\ b=28,\ c=4$

$b^2-4ac=(28)^2-4(49)(4)$

$=784-784=0$

One (repeated) real (rational!) soln

10 pts

(8) $x^2-7x+12$

$=(x-4)(x-3)=0$

$\Rightarrow \boxed{x\in\{3,4\}}$

(9) $6x^2-15x-156$

$=6x^2+24x-39x-156$

$=6x(x+4)-39(x+4)$

$=(x+4)(6x-39)=0$

$\Rightarrow x=-4$

$6x=39$

$x=\frac{39}{6}=\frac{13}{2}$

$\boxed{x\in\{-4,\frac{13}{2}\}}$

Dylan

$2\overline{)156}$
$2\overline{)78}$
$3\overline{)39}$
13

$2\cdot2\cdot3\cdot13$

$24 \quad 39$

$2\overline{)6}$
3

Dylan!

$3(x+4)(2x-13)$ ↳ is better

$2x^2-5x-52=0$

$2x^2-13x+8x-52=0$

$x(2x-13)+4(2x-13)=0$

$(2x-13)(x+4)=0$

121 J 1

(10) $x^2 - 6x + 12 = 0$

$x^2 - 6x = -12$

$x^2 - 6x + 3^2 = -12 + 9$

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

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

$\boxed{x = 3 \pm i\sqrt{3}}$

$b^2 - 12a = 16 + (3)(4) = 16 + 13 = 11$

(11) $3x^2 - 4x - 11 = 0$

$3\left(x^2 - \frac{4}{3}x - \frac{11}{3}\right) = 0$

$x^2 - \frac{4}{3}x - \frac{11}{3} = 0$

$x^2 - \frac{4}{3}x = \frac{11}{3}$

$x^2 - \frac{4}{3}x + \left(\frac{2}{3}\right)^2 = \frac{11}{3} + \frac{4}{9} = \frac{33+4}{9}$

$\left(x - \frac{2}{3}\right)^2 = \frac{37}{9}$

$x - \frac{2}{3} = \pm \frac{\sqrt{37}}{3}$

$\boxed{x = \frac{2 \pm \sqrt{37}}{3}}$

2.694254177

-1.309208433

121 T1

(12) (a) $y = 5(x+2) + 3$

$y = m(x - x_1) + y_1$

$m_{\parallel} = m$

$m_{\perp} = -\frac{1}{m}$

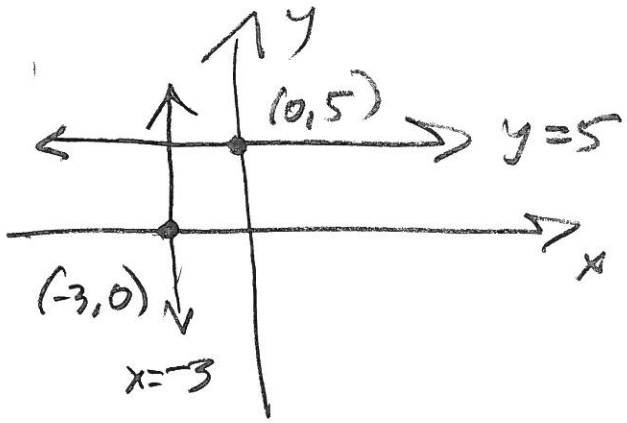
(b) $y = -\frac{1}{5}(x+2) + 3$

Because students don't know when to quit:

(a) $5x + 13 = y$

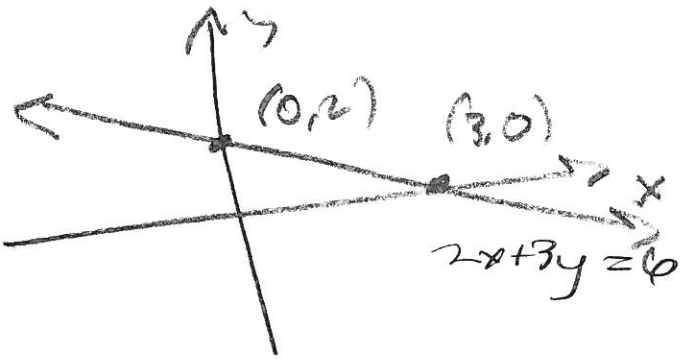
(b) $y = -\frac{1}{5}x + \frac{13}{5}$

(13)



(14) $2x + 3y = 6$

x	y
0	2
3	0



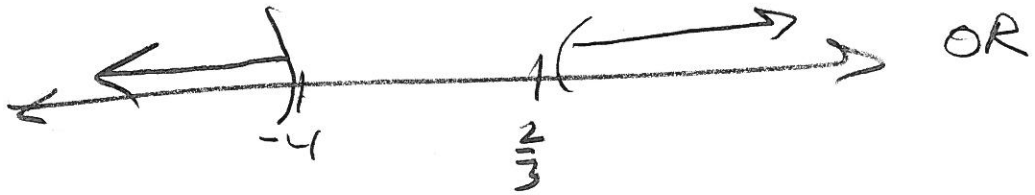
121 T1

15 (a) 10 pts $|3x+5| > 7$

$3x+5 > 7$ OR $3x+5 < -7$

$3x > 2$ $\quad 3x < -12$

$\{x \mid x > \frac{2}{3}$ OR $x < -4\}$

$=$  OR

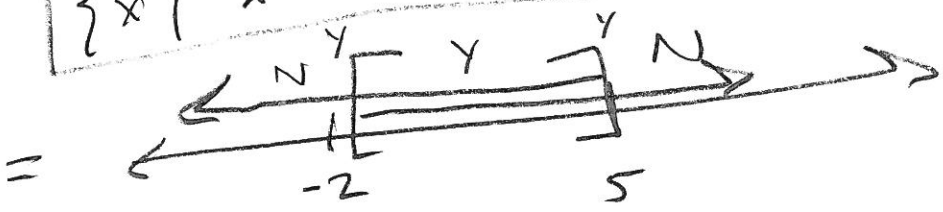
$= (-\infty, -4) \cup (\frac{2}{3}, \infty)$

(b) $|-2x+3| \leq 7$

$-2x+3 \leq 7$ AND $-2x+3 \geq -7$

$-2x \leq 4$ $\quad -2x \geq -10$

$\{x \mid x \geq -2$ AND $x \leq 5\}$

$=$ 

$= [-2, 5]$

121 T1

(15) cont'd (c) $|3x+5|+7>5$ ALWAYS ♡

$|3x+5|>-2$ $\boxed{(-\infty,\infty)} = \{x \mid x \in \mathbb{R}\}$

(d) $|-2x+3|+6<3$

$|-2x+3|<-3$ $\boxed{\emptyset}$ NEVAH!

(16) Let x = amt of 44% alcohol (gal)

Then $\boxed{.44x + .75(5) = .6(x+5)}$

(17) Let x = the amt of time it takes to do the job together (hrs)

Then $\boxed{\frac{1}{5}x + \frac{1}{7}x = 1}$

121 T1

BONUS

(10) Let x = the amt of time Tamara spends on the job.

Then $x+1$ = the amt of time Bill spends

$$\frac{1}{5}x + \frac{1}{7}(x+1) = 1 \qquad LCD = 5 \cdot 7$$

$$\frac{x}{5} + \frac{x+1}{7} = 1$$

$$\frac{7x + 5(x+1)}{LCD} = \frac{35}{LCD}$$

$$7x + 5x + 5 = 35$$

$$12x + 5 = 35$$

$$12x = 30$$

$$x = \frac{30}{12} = \frac{15}{6} = \boxed{\frac{5}{2} = x}$$

$$\Rightarrow x+1 = \frac{5}{2} + \frac{2}{2} = \boxed{\frac{7}{2} = x+1}$$

121 T1

(19) $y = 12x - 7$

x	y	
0	-7	FREE
$\frac{7}{12}$	0	

$12x - 7 = 0$

$12x = 7$

$x = \frac{7}{12}$

(20) $f(x) = x^2 - 6x + 12$

$= x^2 - 6x \quad + 12$

$= x^2 - 6x + 3^2 + 12 - 9$

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

(21) $x^4 - 7x^2 + 12 = 0$

$(x^2 - 3)(x^2 - 4) = 0$

$(x - \sqrt{3})(x + \sqrt{3})(x - 2)(x + 2) = 0$

$\boxed{x \in \{\pm\sqrt{3}, \pm 2\}}$