Math 111 EXAM 1, ~~FALL 2015~~ Spring 2018 **Name:** 58 points

Except where noted otherwise, each numbered exercise is worth six points. Be sure to label all answers to word problems with units.

1. Let $g(x) = 2x - x^2$. **Show how you obtain your answers to each of the following.**

(a) Find $g(-5)$. *2 points*

$g(-5) = 2(-5) - (-5)^2$

$= -10 - 25$

$g(-5) = -35$

(b) Find all values of x such that $g(x) = -24$. *4 points*

$-24 = 2x - x^2$ +2½

$24 = x^2 - 2x$

$0 = x^2 - 2x - 24$ +1

$0 = (x-6)(x+4)$ +3

$x = -4, 6$ +1

½

2. Give the domain of each function, using any notation *other than a number line* you wish that correctly describes the domain. (You might wish to use a number line to determine your answer.) **Box your answers.**

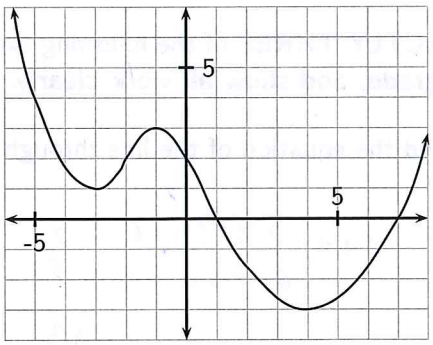
(a) $f(x) = \dfrac{1}{x^2 - 3x}$

$x \neq 0, 3$

(b) $g(x) = \sqrt{x-3}$

$x \geq 3$ or $[3, \infty)$ +1 3 +1 include 3 +1 direction

3. The graph of a function f is shown below and to the right. Use it to answer the following questions. **Some of your values may need to be approximate.** *2 points each part*



(a) Give $f(-1)$. $f(-1) = 3$

(b) Give all values of x such that $f(x) = 1$.

$-3, \frac{1}{2}, 7\frac{1}{2}$

(c) Give all intervals on which $f(x)$ is positive.

$(-\infty, 1) \cup (7, \infty)$

(d) Give all intervals on which the function is increasing.

$(-3, -1) \cup (4, \infty)$

(d) For each of the following, fill in the first blank with either *relative* or *absolute*, the second blank with either *maximum* or *minimum*, and the last two blanks with numbers. **Use "absolute" when possible.**

The function has a(n) absolute minimum of -3 at 4.

The function has a(n) relative minimum of 1 at -3.

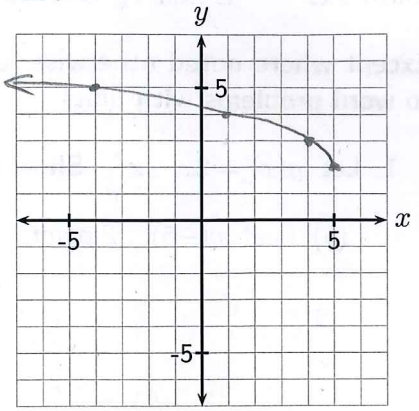
relative maximum 3 -1

+22

4. **Accurately** sketch the graph of $y = \sqrt{5 - x} + 2$ on the grid. **Plot at least four points with integer coordinates**, indicating the pairs in the table.

x	y
5	2
4	3
1	4
-4	5

Shape $1\frac{1}{2}$
Points $1\frac{1}{2}$
← $1\frac{1}{2}$
↘ $1\frac{1}{2}$



5. Find the x- and y- intercepts of $x = y^2 + 2y - 15$ **algebraically, showing how it is done.** (This means by solving an equation, not by graphing.)

x-intercepts: -15 +2

y-intercepts: $-5, 3$ +2 each

$0 = y^2 + 2y - 15$
$0 = (y+5)(y-3)$
$y = -5, 3$

Do **EXACTLY THREE** of the following exercises on additional paper. **Cross out the three that you don't want me to grade, and show all work clearly.**

6. Find the equation of the line through $(-3, -1)$ and $(6, 5)$ **algebraically**.

$m = \frac{5-(-1)}{6-(-3)} = \frac{6}{9} = \frac{2}{3}$ +3

$y = \frac{2}{3}x + b$
$5 = \frac{2}{3}(6) + b$
$5 = 4 + b$
$b = 1$ +3

$y = \frac{2}{3}x + 1$

+12

7. Solve $\frac{30}{1}\left(\frac{1}{15}x^2+\frac{1}{10}\right)=\left(\frac{1}{6}x\right)\frac{30}{1}$

$2x^2+3=5x$ +3

$2x^2-5x+3=0$ +1

$(2x-3)(x-1)=0$ +1

$x=\frac{3}{2},1$ +1 +3

8. Solve $\sqrt{x-2}+2=x$.

$\sqrt{x-2}=x-2$

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

$0=x^2-5x+6$ +3

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

$x=2,3$ +3

9. An object is projected upward at 37.5 feet per second from a height of 4.3 feet. Its height h (in feet) above the ground at any time t seconds after it is projected is given by

$$h=-16t^2+37.5t+4.3.$$

Determine, to the nearest hundredth of a second, when the object will be 15 feet above the ground.

$15=-16t^2+37.5t+4.3$

$0=-16t^2+37.5t-10.7$

$t=\frac{-37.5\pm\sqrt{(37.5)^2-4(-16)(-10.7)}}{2(-16)}$

$=\frac{-37.5\pm\sqrt{1406.25-684.8}}{-32}$

$=\frac{-37.5\pm\sqrt{721.45}}{-32}$

$=\frac{-37.5+\sqrt{721.45}}{-32}$

$t=0.33$ seconds

$=\frac{-37.5-\sqrt{721.45}}{-32}$

$t=2.01$ seconds

+18

10. Solve the system $\begin{array}{rcl} 5x-3y &=& 7 \\ 2x+7y &=& -12 \end{array}$, **giving your answer in exact form (no decimals).**

$5x-3y=7 \Rightarrow 35x-21y=49$

$2x+7y=-12 \Rightarrow 6x+21y=-36$

$41y=13$

$y=\frac{13}{41}$

$\Rightarrow 10x-6y=14$

$\Rightarrow -10x-35y=60$

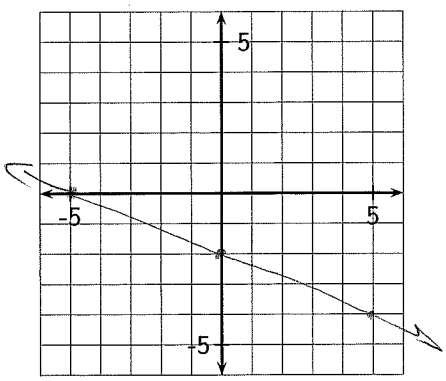
$-41y=74$

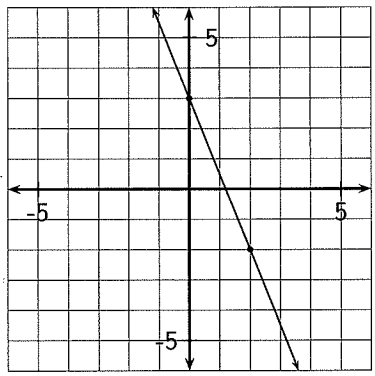
$y=-\frac{74}{41}$

$-5y=2x+10$

$y=-\frac{2}{5}x-2$

11. Graph the line with equation $-2x-5y=10$ on the grid below and to the left. The equation of the line graphed below and to the right is $y=-\frac{5}{2}x+3$

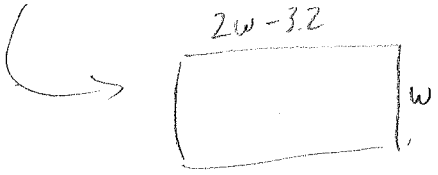




Do **EXACTLY ONE** of the following exercises in the space below. **Circle the number of the one you wish for me to grade.**

12. The one leg of a right triangle is 7 inches longer than the shorter leg, and the hypotenuse is 8 inches longer than the shorter leg. Determine the length of each side of the triangle.

13. The length of a rectangle is 3.2 inches less than twice its width, and its perimeter is 57.2 inches. Write an equation that can be solved to give the length or width of the rectangle. Then find the length and width.



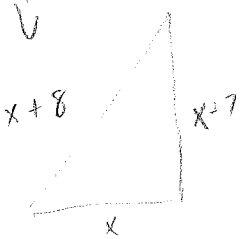
$w+(2w-3.2)+w+(2w-3.2)=57.2$

$6w-6.4=57.2$

$6w=63.6$

$w=10.6$

width is 10.6 inches
length is 18 inches



$x^2+(x+7)^2=(x+8)^2$

$x^2+x^2+14x+49=x^2+16x+64$

$x^2-2x-15=0$

$(x-5)(x+3)=0$

$x=5, -3$

Short leg: 5
long leg: 12
hypotenuse: 13

+6