MAC1105 Test 2 Name Key
(Deborah Howard 3-16)

8.1 #5 1. Sketch a complete graph of $f(x)$. Remember that your graph is the solution, so show appropriate detail including the coordinates of all corner points.

(12)

$$f(x)=\begin{cases}20x+y\le 60\\ -300x+10y>400\\ x\ge 0,\ y\ge 0\end{cases}$$

$20x+y\le 60$

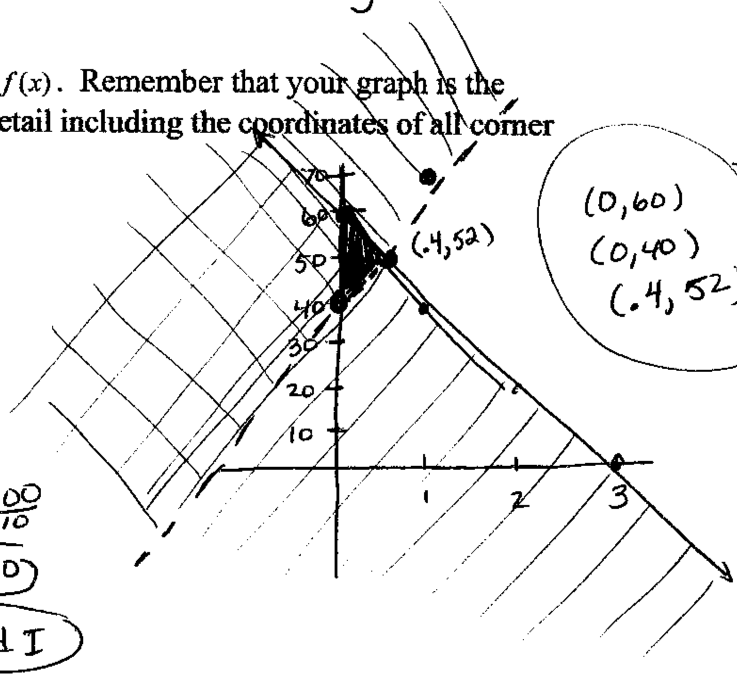
Solid line: $y\le -20x+60$

$-300x+10y>400$

$\frac{10y}{10}>\frac{300x}{10}+\frac{400}{10}$

dotted line: $y>30x+40$

$x\ge 0,\ y\ge 0$ Quad I



(0,60)
(0,40)
(.4,52)

8.1 #12 2. Many elevators have a capacity of 1000 pounds. Let us say that a child averages 40 pounds and an adult averages 130 pounds.

a.) Write an inequality that describes when x children and y adults will cause the elevator to be overloaded.

(6)

$$\begin{cases}40x+130y>1000\\ x\ge 0,\ y\ge 0\end{cases}$$

b.) Sketch a complete graph. Remember that your graph is the solution, so show appropriate detail including the coordinates of all corner points.

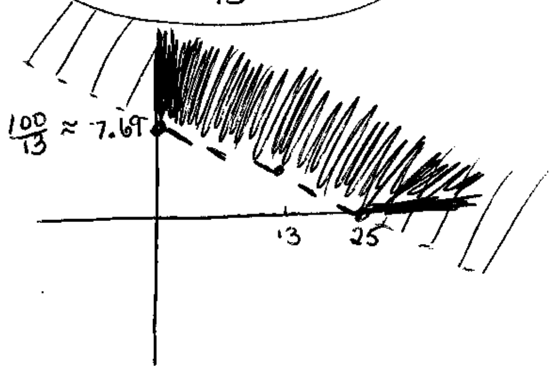
(12) $40x+130y>1000$

$\frac{130y}{130}>\frac{-40}{130}x+\frac{1000}{130}$

dotted line: $y>\frac{-4}{13}x+\frac{100}{13}$

$x\ge 0,\ y\ge 0$

Quad I



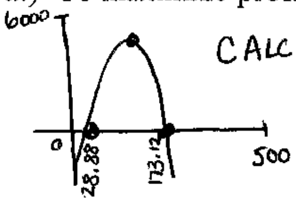
(25,0)
(0,7.69)

3.1 #16

3. The profit for a product can be described by the function $P(x) = 202x - 5000 - x^2$ dollars, where x is the number of units produced and sold.

$Y1 = 202x - 5000 - x^2$

6 a.) To maximize profit, how many units must be produced or sold?



CALC #4

$V(101, 5201)$

101 units

OR

$X = \frac{-b}{2a} = \frac{-(202)}{2(-1)}$

$X = \frac{-202}{-2} = $ 101 units

6 b.) What is the maximum possible profit?

\$5201

3.2 #13

c.) Find the x-intercepts.

6 $Y2 = 0$ CALC #5

$X = 28.88, 173.12$

OR

$a = -1 \quad b = 202 \quad c = -5000$

$X = \frac{-202 \pm \sqrt{202^2 - 4(-1)(-5000)}}{2(-1)}$

$X = \frac{-202 \pm 144.2359179}{-2}$

$X = 28.88, 173.12$

6 d.) State the meaning of the x-intercepts in the context of the problem.

The profit will be zero (break even) if 28.88 or 173.12 units are produced and sold.

6 4. Given $f(x) = -x^2 - 60x + 2100$. Find the vertex **algebraically**.

3.1 #10

$a = -1 \quad b = -60 \quad c = 2100$

$X = \frac{-b}{2a} = \frac{-(-60)}{2(-1)} = -30$

$Y = -(-30)^2 - 60(-30) + 2100 = 3000$

$V(-30, 3000)$

3.2 #3,4,8

5. Given $f(x) = 6x^2 - 19x - 7$.

Cannot do root method since $b = -19$

(6) a.) Find the x-intercepts by a method of your choice.

Q.F. $a = 6 \quad b = -19 \quad c = -7$

$$x = \frac{-(-19) \pm \sqrt{(-19)^2 - 4(6)(-7)}}{2(6)} = \frac{19 \pm \sqrt{361 + 168}}{12} = \frac{19 \pm \sqrt{529}}{12}$$

$$x = \frac{19 \pm 23}{12} = 3.5,\ -.\bar{3} \quad \text{OR} \quad 7/2,\ -1/3$$

(6) b.) Find the x-intercepts again by a different method than used above.

Factoring $0 = 6x^2 - 19x - 7$

$0 = (3x + 1)(2x - 7)$

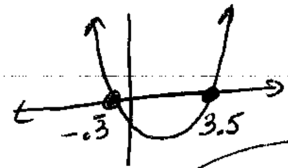
$3x + 1 = 0 \qquad 2x - 7 = 0$

$x = -\frac{1}{3} \qquad x = \frac{7}{2}$

OR Graphing $Y1 = 6x^2 - 19x - 7$

$Y2 = 0$

CALC #5



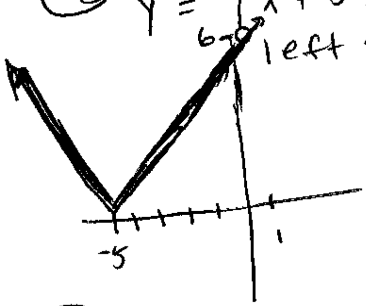
$x = -.\bar{3},\ 3.5$

3.3 #6

6. Show a complete sketch of the graph of $f(x) = \begin{cases} |x+5|;\ x < 1 \\ \sqrt{x} + 2;\ x \geq 1 \end{cases}$

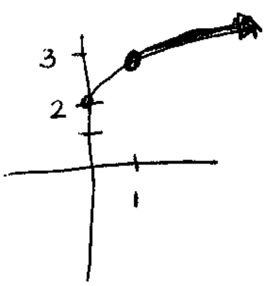
(12) $y = |x + 5|$

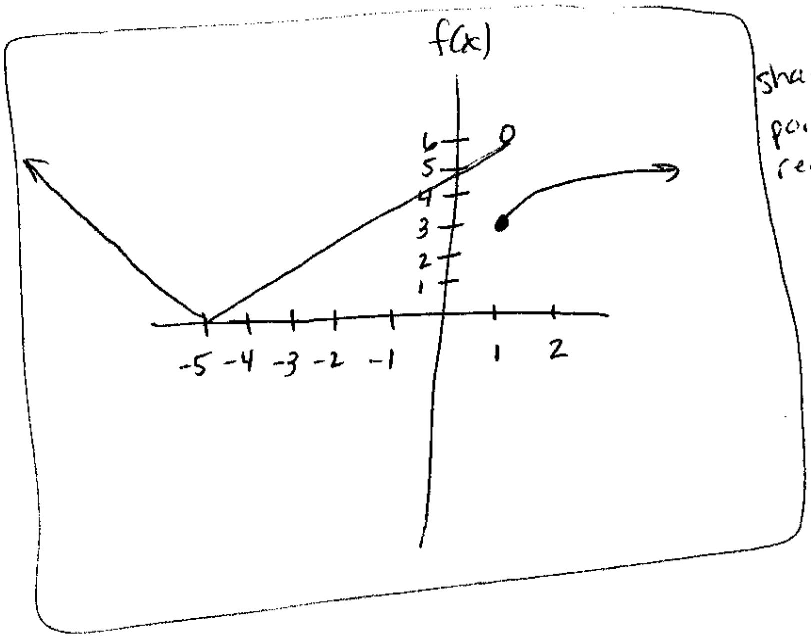
left 5



$y = \sqrt{x} + 2$

up 2





shape
points
region

3.3 #13

7. First class postage with a private postal service costs$ 0.29 for all weights through 1 ounce, plus $0.16 for each ounce or fraction of an ounce thereafter. Each letter is required to carry one $ 0.29 stamp and as many $0.16 stamps as necessary. Let the function $f(x)$ represent the number of stamps on a letter weighing x ounces up to 3 ounces.

6

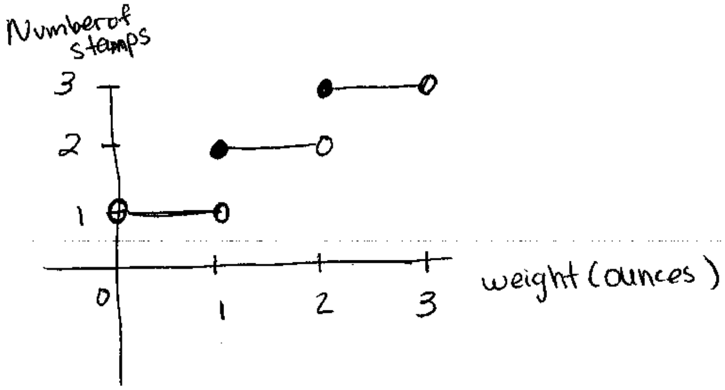
a.) Complete the equation that models this problem.

$$f(x)=\begin{cases} 1 & ;0<x<1 \\ 2 & ;1\le x<2 \\ 3 & ;2\le x<3 \end{cases}$$

$$\begin{array}{r} .29 \\ +\ .16 \\ \hline .45 \end{array} \qquad \begin{array}{r} .29 \\ .32 \\ \hline .61 \end{array}$$

b.) Show a complete sketch of the graph.

10



weight x	number of stamps $f(x)$	
0	0	
.5	1	29¢ stamp
1	2	29¢ and 16¢
1.5	2	
2	3	29¢ and 2 16¢
2.5	3	