Do your own work. There are up to 10 Bonus Points available. So choose the 10 points you want to try for and write the word OMIT next to all the ones you don't.

1. (5 pts) Solve the absolute value equation $|2x - 5| = 7$.

$$2x - 5 = 7$$
$$2x = 12$$
$$\boxed{x = 6}$$

$$2x - 5 = -7$$
$$2x = -2$$
$$\boxed{x = -1}$$

Bonus (5 pts) What is the solution set for #1?

$$x \in \{-1, 6\}$$

2. Solve the absolute value inequalities. Express your answer in set-builder notation and interval notation.

a. (5 pts) $|2x - 5| < 7$

$$2x - 5 < 7 \text{ and } 2x - 5 > -7$$
$$2x < 12 \text{ and } 2x > -2$$
$$\{x \mid x < 6 \text{ and } x > -1\}$$
$$= (-1, 6)$$

b. (5 pts) $|2x - 5| > 7$

$$2x - 5 > 7 \quad \text{OR} \quad 2x - 5 < -7$$
$$2x > 12 \quad \text{OR} \quad 2x < -2$$
$$\{x \mid x > 6 \quad \text{OR} \quad x < -1\}$$
$$= (-\infty, -1) \cup (6, \infty)$$

3. Solve the absolute value inequalities

a. (5 pts) $|2x - 5| < -7$.

$$\varnothing$$

b. (5 pts) $|2x - 5| > -7$

$$(-\infty, \infty)$$

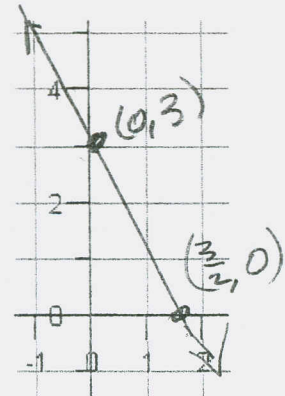4. All graphs must include any x- or y-intercepts.

   a. (5 pts) Graph the line $y = -2x + 3$

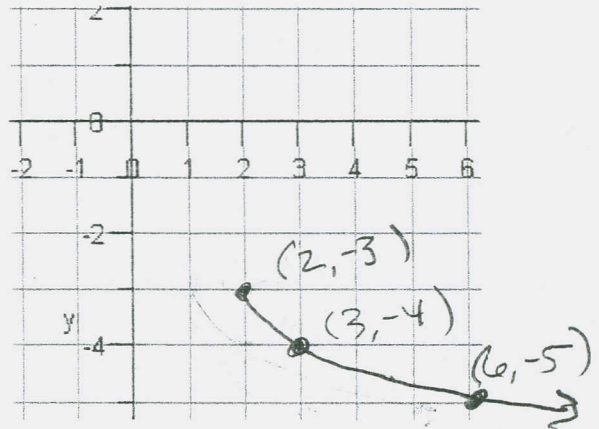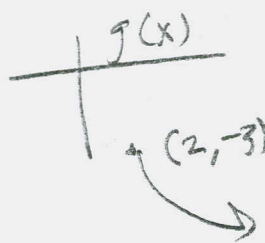 $$\begin{array}{c|c} x & y \\ \hline 0 & 3 \\ & 0 \end{array}$$
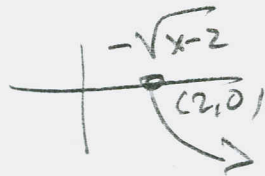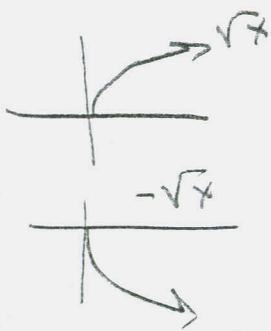
   $-2x + 3 = 0$

   $-2x = -3$

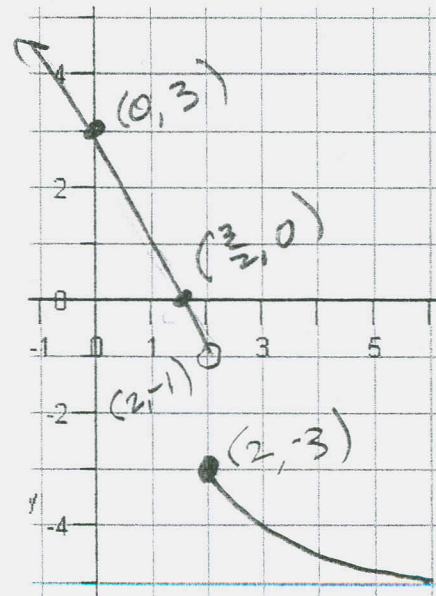 $x = \dfrac{3}{2} = 1.5$

5. (5 pts) Graph the function $g(x) = -\sqrt{x-2} - 3$

6. (5 pts) Graph the piecewise-defined function

   $$f(x) = \begin{cases} -2x + 3 & \text{if } x < 2 \\ -\sqrt{x-2} + 3 & \text{if } x \geq 2 \end{cases}$$

   $-2(2) + 3 = -4 + 3 = -1$

7. Solve the system of equations $\begin{array}{l} x + 5y = 7 \\ 3x - 2y = 5 \end{array}$ by two methods:

a. (5 pts) Substitution

$x = 7 - 5y$

$3(7 - 5y) - 2y = 5$

$21 - 15y - 2y = 5$

$-17y + 21 = 5$

$-17y = -16$

$\boxed{y = \frac{16}{17}}$

$x = 7 - 5\left(\frac{16}{17}\right)$

$= 7 - \frac{80}{17}$

$= \frac{119 - 80}{17} = \boxed{\frac{39}{17} = x}$

$\begin{array}{r} {}^{4,7}_{} \\ \times 7 \\ \hline 119 \end{array}$

b. (5 pts) Elimination

$-3(x + 5y = 7)$

$-3x - 15y = -21$

$\underline{3x - 2y = 5}$

$-17y = -16$

$\boxed{y = \frac{16}{17}}$

$x + 5\left(\frac{16}{17}\right) = 7$

$x + \frac{80}{17} = 7$

$x = 7 - \frac{80}{17}$

$= \frac{119 - 80}{17} = \boxed{\frac{39}{17} = x}$

8. (5 pts) How much 20% alcohol and 50% alcohol will it take to create 5 gallons of 37% alcohol?

Let x = amt of 20% alcohol (gallons)

y = " " 50% " "

$x + y = 5$

$.2x + .5y = .37(5)$

$.2(5 - y) + .5y = 1.85$

$1 - .2y + .5y = 1.85$

$.3y + 1 = 1.85$

$.3y = .85$

$y = \frac{.85\overset{2}{\cancel{0}}{}^{1}}{.3} = 2.8\overline{3}$

$\boxed{y = 2.8\overline{3}} \Rightarrow$

$x = 5 - 2.8\overline{3} = \boxed{2.1\overline{6} = x}$

9. (5 pts) Big Jim's Bike Rims is having a 20% Off! sale. If the price of a special bike rim is \$50 after the 20% discount., what was its price without the discount?

$x = $ price b4 discount in \$

$x - .2x = 50$

$.8x = 50$

$x = \dfrac{50}{.8} = \boxed{\$62.50}$

$$\begin{array}{r} 6.25 \\ 8\,\overline{\big)\,50.0000} \\ 48.0000 \\ \hline 2.0000 \\ 1.6000 \\ \hline .4000 \end{array}$$

10. (5 pts) Find an equation for the line passing through the points (2, 3) and (-4, 6).

$m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{6-3}{-4-2} = \dfrac{3}{-6} = -\dfrac{1}{2}$

$y = m(x - x_1) + y_1 \quad \Longrightarrow \quad \boxed{y = -\dfrac{1}{2}(x-2) + 3}$

11. (5 pts) Find an equation of the line passing through (2, 3) that is parallel to the line with equation $y = 2x + 7$.

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

Bonus (5 pts) Find an equation of the line passing through (2, 3) that is perpendicular to the line with equation $y = 2x + 3$.
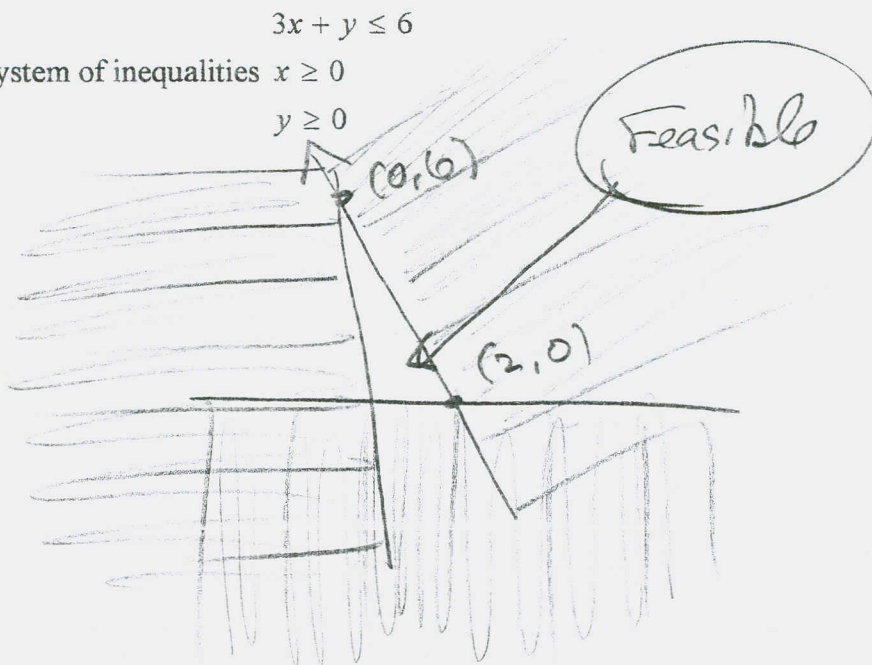
$\boxed{y = -\dfrac{1}{2}(x-2) + 3}$

$$3x + y \le 6$$

Bonus (5 pts) Sketch the system of inequalities $x \ge 0$

$$y \ge 0$$

$3x + y \le 6$

x	y
0	6
2	0

$0 \le 6$?

$(0,0)$ Good.

(0,6)

(2,0)

Feasible

Bonus (5 pts) Solve *one* of the following quadratic equations by factoring.

a. $x^2 - 3x - 10 = 0 \rightarrow (x-5)(x+2) = 0 \Rightarrow x \in \{-2, 5\}$

b. $x^2 - 16 = 0 \Rightarrow (x-4)(x+4) = 0 \Rightarrow x \in \{-4, 4\}$

c. $4x^2 - 20x + 5^2 = 0$

$$(2x)^2 - 2(2x)(5) + 5^2$$

$$= (2x-5)^2 \quad \overset{SET}{=} 0$$

$$\Rightarrow 2x = 5$$

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

Bonus (5 pts) Find the *real* solution of the cubic equation $x^3 - 64 = 0$ by factoring.

$$(x-4)(x^2 + 4x + 16) = 0$$

$$\Rightarrow x = 4$$