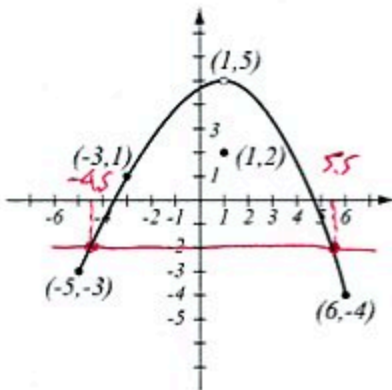


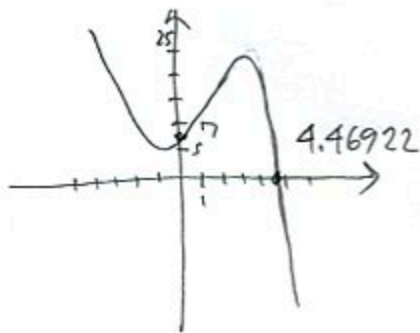
1. (8pts) Use the graph of the function f at right to answer the following questions.

- a) Find: $f(-3) = 1$ $f(1) = 2$
 b) What is the domain of f ? $[-5, 6]$
 c) What is the range of f ? $[-4, 5]$
 d) What are the solutions of the equation $f(x) = -2$?
 $x = -4.5, 5.5$



2. (10pts) Use your calculator to accurately sketch the graph of $y = -x^3 + 3x^2 + 5x + 7$. Draw the graph here, and indicate units on the axes. Find all the x - and y -intercepts (accuracy: 6 decimal points).

y -int: 7
 x -int: 4.46922



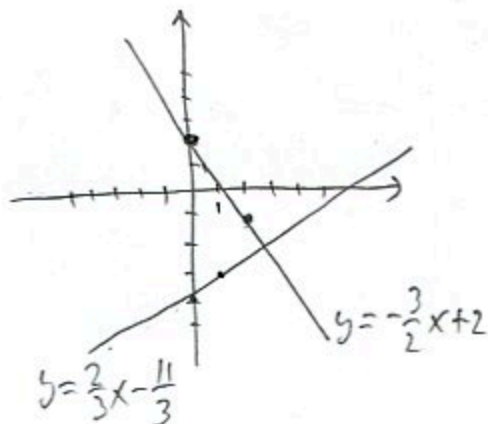
3. (5pts) Write the equation of the line whose slope is -2 and whose x -intercept is 3.

Passes through (3, 0) $y - 0 = -2(x - 3)$
 $y = -2x + 6$

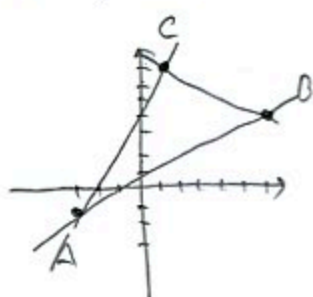
4. (10pts) Find the equation of the line (in form $y = mx + b$) that passes through point (1, -3) and is perpendicular to the line $3x + 2y = 4$. Draw both lines.

$3x + 2y = 4$ Slope of perp. line is $\frac{2}{3}$
 $2y = -3x + 4 \quad | \div 2$ $y - (-3) = \frac{2}{3}(x - 1)$
 $y = -\frac{3}{2}x + 2$ $y + 3 = \frac{2}{3}x - \frac{2}{3}$
 $y = \frac{2}{3}x - \frac{11}{3}$

$-\frac{2}{3} - 3 = -\frac{11}{3}$



5. (8pts) Draw the triangle with vertices $A = (-3, -1)$, $B = (6, 4)$ and $C = (1, 7)$. Use either slopes or distance to determine if this is a right triangle.



Slopes:

$$AB: \frac{4 - (-1)}{6 - (-3)} = \frac{5}{9}$$

$$BC: \frac{7 - 4}{1 - 6} = \frac{-3}{5}$$

$$CA: \frac{-1 - 7}{-3 - 1} = \frac{-8}{-4} = 2$$

no two are opposite reciprocals, so no two are perpendicular

6. (9pts) Let $g(x) = \frac{x-1}{x^2-3}$. Find the following (simplify where appropriate).

$$g(-4) = \frac{-4-1}{(-4)^2-3} = \frac{-5}{16-3} = -\frac{5}{13}$$

$$g(\sqrt{3}) = \frac{\sqrt{3}-1}{\sqrt{3}^2-3} = \frac{\sqrt{3}-1}{0} = \text{not defined}$$

$$g(-2x) = \frac{-2x-1}{(-2x)^2-3} = \frac{-2x-1}{4x^2-3}$$

$$g(a+2) = \frac{a+2-1}{(a+2)^2-3}$$

$$= \frac{a+1}{a^2+2 \cdot a \cdot 2+2^2-3} = \frac{a+1}{a^2+4a+1}$$

7. (9pts) Find the domains of the functions below and write them using interval notation.

$$f(x) = \frac{x-13}{x^2+3x-18}$$

Can't have

$$x^2+3x-18=0$$

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

$$x = -6, 3$$

~~the domain is~~

$$\begin{array}{cc} -6 & 3 \end{array}$$

$$(-\infty, -6) \cup (-6, 3) \cup (3, \infty)$$

$$g(x) = \sqrt{2x-5}$$

Must have:

$$2x-5 \geq 0$$

$$2x \geq 5$$

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

~~the domain is~~

$$\frac{5}{2}$$

$$\left[\frac{5}{2}, \infty\right)$$

8. (5pts) Solve the inequality and write your solution in interval notation.

$$2 \leq 3x - 2 \leq 7 \quad | +2 \quad \frac{4}{3} \leq x \leq 3$$

$$4 \leq 3x \leq 9 \quad | \div 3 \quad \left[\frac{4}{3}, 3 \right]$$

9. (10pts) A circle has center $(-2, 3)$ and passes through the point $(1, 2)$.

a) Find the equation of the circle.

b) Draw the circle in the coordinate plane.

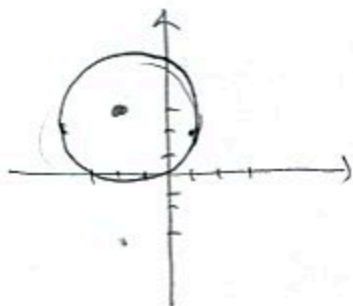
a) $r =$ distance from $(-2, 3)$ to $(1, 2)$

$$= \sqrt{(1 - (-2))^2 + (2 - 3)^2}$$

$$= \sqrt{3^2 + (-1)^2} = \sqrt{10}$$

$$(x - (-2))^2 + (y - 3)^2 = \sqrt{10}^2$$

$$(x + 2)^2 + (y - 3)^2 = 10$$



10. (12pts) Frank, a salesman at a clothing store, can be paid under one of two plans:

A) salary of \$1,250 plus 10% of sales over \$1,000

B) salary of \$1,100 plus 20% of sales over \$2,000.

Assuming Frank always has sales of at least \$2,000, for which amount of sales is plan A better?

$x =$ amount of sales
 \downarrow
 income

A) $I(x) = 1250 + 0.10(x - 1000), \quad x \geq 2000$

B) $I(x) = 1100 + 0.20(x - 2000)$

$$A \geq B$$

$$1250 + 0.10(x - 1000) \geq 1100 + 0.20(x - 2000)$$

$$1250 + 0.1x - 100 \geq 1100 + 0.2x - 400$$

$$0.1x + 1150 \geq 0.2x + 700 \quad | -0.1x - 700$$

$$450 \geq 0.1x$$

$$\frac{450}{0.1} \geq x$$

$$x \leq 4500$$

For sales $2000 \leq x \leq 4500$

plan A is better.

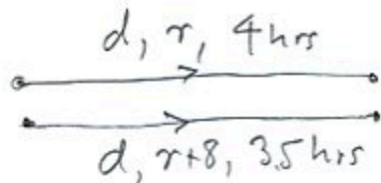
11. (14pts) A truck starts driving eastward from Murray along state route 80. A car driving 8mph faster starts along the same route half an hour afterwards. After the car drives three and a half hours, it catches up with the truck.

a) How fast are the truck and the car?

b) How far from Murray are they when the car catches up with the truck?

$d =$ distance from Murray

$r =$ truck's speed



$$r = \frac{28}{0.5} = 56$$

a) Truck: 56 mph

Car: 64 mph (56+8)

b) $64 \cdot 3.5 = 224$ miles

same $\left\{ \begin{array}{l} d = r \cdot 4 \\ d = (r+8) \cdot 3.5 \end{array} \right.$

so $4r = 3.5(r+8)$

$$4r = 3.5r + 28 \quad | -3.5r$$

$$0.5r = 28$$

Bonus (10pts) Two containers with 40% and 65% solutions of orthophosphoric acid were mixed. The result was 5 liters of a 47% solution of orthophosphoric acid. How much acid solution was in each of the two containers?

$x =$ amt. of 40% sol.

$5-x =$ amt. of 65% sol.

$$\left[\begin{array}{c} x \\ 40\% \end{array} \right] + \left[\begin{array}{c} 5-x \\ 65\% \end{array} \right] = \left[\begin{array}{c} 5 \\ 47\% \end{array} \right]$$

$$0.4x + 0.65(5-x) = 0.47 \cdot 5$$

$$0.4x + 3.25 - 0.65x = 2.35 \quad | -3.25$$

$$-0.25x = -0.9$$

$$x = \frac{-0.9}{-0.25} = 3.6$$

3.6 L of 40% sol.

1.4 L of 65% sol.