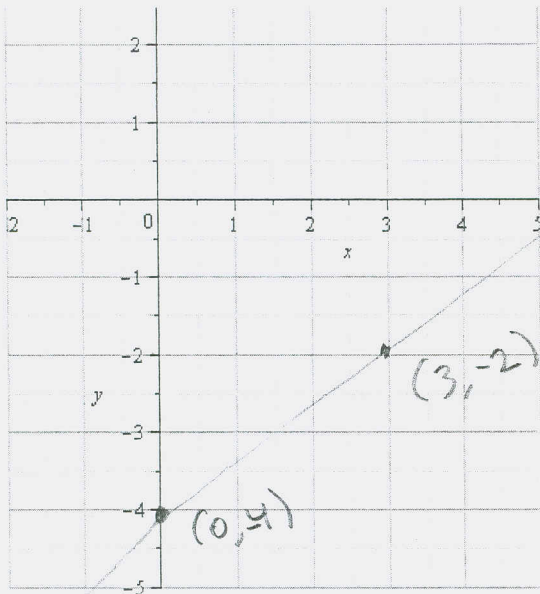


1. Let $f(x) = \frac{2}{3}x - 4$ in the following:

a. (5 pts) Determine the slope and y-intercept of f .

$$m = \frac{2}{3} \quad y\text{-int: } (0, -4)$$

b. (5 pts) Use the slope and y-intercept to graph f here:



c. (5 pts) Determine the average rate of change of f .

$$m_{\text{AVG}} = \frac{2}{3} = m$$

d. (5 pts) Is f increasing, decreasing or constant?

Increasing

2. (5 pts) Suppose y varies jointly as x and z and inversely as the cube of w .

If $y = 2$ when $x = 3$, $z = 2$, and $w = 2$ what is y when $x = 5$, $z = 2$, and $w = 2$?

$$y = k \frac{xz}{w^3}$$

$$2 = k \frac{3 \cdot 2}{2^3}$$

$$2^4 = 6k$$

$$\frac{2^4}{6} = k = \frac{2^3}{3} = \frac{8}{3}$$

$$y = \frac{8}{3} \left(\frac{5 \cdot 2}{2^3} \right) = \frac{10}{3}$$

3. Let $f(x) = 2x^2 + 5x - 12$.

a. (5 pts) Find the zeros of f by factoring.

$$= 2x^2 + 8x - 3x - 12$$

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

$$= (x+4)(2x-3) \stackrel{\text{SET}}{=} 0 \rightarrow$$

$$(2)(-12) = -24$$

$$(8)(-3) = -24$$

$$8-3 = 5$$

$$x = -4, \frac{3}{2}$$

b. (5 pts) Find the zeros of f by quadratic formula.

$$a=2, b=5, c=-12$$

$$b^2 - 4ac = (5)^2 - 4(2)(-12)$$

$$= 25 + 96$$

$$= 121$$

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

$$= \frac{-5 \pm \sqrt{121}}{2(2)} = \frac{-5 \pm 11}{4}$$

$$x = \frac{-5 + 11}{4} = \frac{6}{4} = \frac{3}{2}$$

$$x = \frac{-5 - 11}{4} = \frac{-16}{4} = -4$$

$$x = -4, \frac{3}{2}$$

c. (5 pts) Find the zeros of $f(x) = x^2 - 4x - 7$ by completing the square.

$$f(x) = 0$$

$$x^2 - 4x - 7 = 0$$

$$x^2 - 4x = 7$$

$$x^2 - 4x + 2^2 = 7 + 4$$

$$(x-2)^2 = 11$$

$$x-2 = \pm \sqrt{11}$$

$$x = 2 \pm \sqrt{11}$$

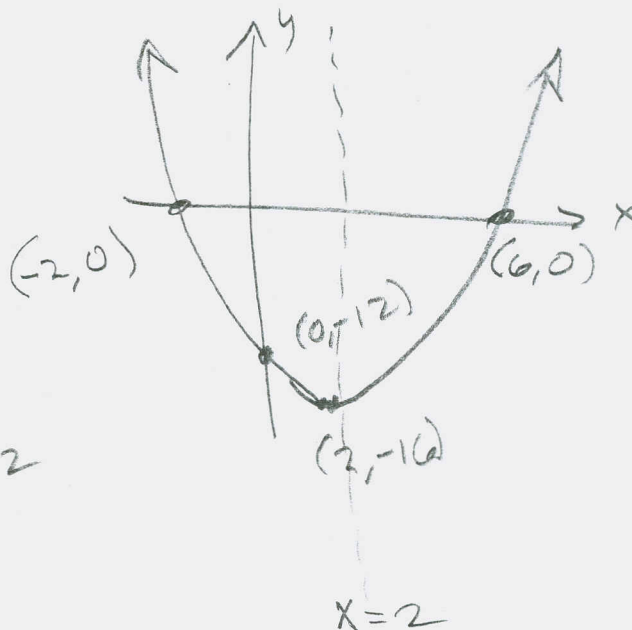
4. (20 pts) Complete the square for $f(x) = x^2 - 4x - 12$, and re-write it in the form $a(x-h)^2 + k$. Sketch its graph, based on your work. Label the vertex, axis of symmetry, and x - and y -intercepts on your graph. State the range of f .

$$\begin{aligned} f(x) &= x^2 - 4x - 12 \\ &= x^2 - 4x + 2^2 - 4 - 12 \\ &= (x-2)^2 - 16 \end{aligned}$$

$$\text{Set } 0 \Rightarrow (x-2)^2 = 16$$

$$\begin{aligned} x-2 &= \pm 4 \\ x &= 2 \pm 4 \end{aligned}$$

$$\mathcal{R} = [-16, \infty)$$



5. (10 pts) Compute the discriminant for $h(x) = 5x^2 - 4x + 1$. How many zeroes does h have, and are they real, nonreal, one of each, or what?

$$a=5, b=-4, c=1 \Rightarrow b^2 - 4ac = 4^2 - 4(5)(1) = 16 - 20 = -4$$

Two, distinct, nonreal zeroes

6. (10 pts) Find the complex zeros of $f(x) = 4x^2 - 5x + 2$. Leave your answer in simplified radical form (no calculator stuff).

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

$$= \frac{5 \pm \sqrt{-7}}{2(4)}$$

$$= \frac{5 \pm \sqrt{-7}}{8} = \boxed{\frac{5 \pm i\sqrt{7}}{8}}$$

$$a=4, b=-5, c=2$$

$$b^2 - 4ac = 5^2 - 4(4)(2)$$

$$= 25 - 32$$

$$= -7$$

7. (10 pts) Solve $2x^2 < 5x + 7$. Express your answer in both set-builder and interval notation.

$$2x^2 < 5x + 7$$

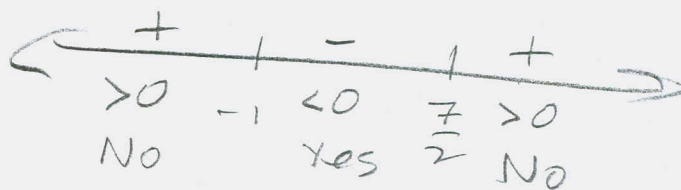
$$2x^2 - 5x - 7 < 0$$

$$2x^2 - 7x + 2x - 7 < 0$$

$$x(2x-7) + 1(2x-7) < 0$$

$$(2x-7)(x+1) < 0$$

$$x = -1, \frac{7}{2} \text{ are critical}$$



$$x \in \left(-1, \frac{7}{2}\right) = \left\{x \mid -1 < x < \frac{7}{2}\right\}$$

8. (5 pts) Solve $|3x - 5| = 2$

$$3x - 5 = 2 \text{ OR } 3x - 5 = -2$$

$$3x = 7 \text{ OR } 3x = 3$$

$$x = \frac{7}{3} \text{ OR } x = 1$$

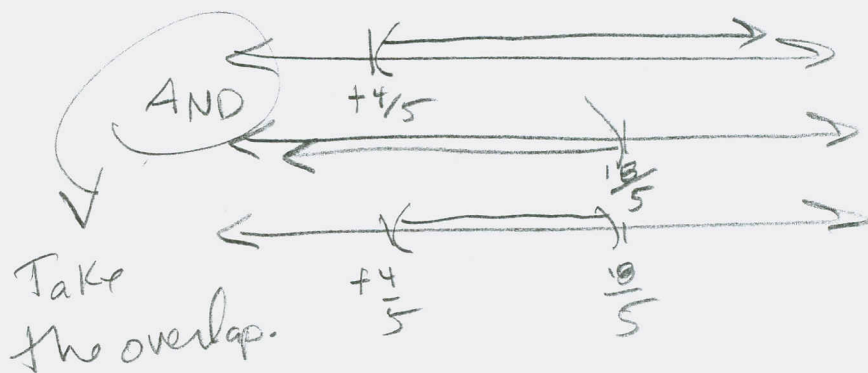
$$\left\{1, \frac{7}{3}\right\}$$

9. (5 pts) Solve $|5x - 11| < 7$

$$5x - 11 < 7 \text{ AND } 5x - 11 > -7$$

$$5x < 18 \text{ AND } 5x > 4$$

$$x < \frac{18}{5} \text{ AND } x > \frac{4}{5}$$



$$\left(\frac{4}{5}, \frac{18}{5}\right)$$