

Solve the inequalities. Write your solution in interval notation.

1. (5pts) $-2 \leq 3x - 4 < 8$ $+4$ 2. (7pts) $2x - 2 \leq -1$ or $4x + 3 > 12$

$$2 \leq 3x < 12 \quad | \div 3$$

$$\frac{2}{3} \leq x < 4$$

~~$\frac{2}{3}$~~ $\left[\frac{2}{3}, 4\right)$

$$2x \leq 1 \quad 4x > 9$$

$$x \leq \frac{1}{2} \quad \text{or} \quad x > \frac{9}{4}$$

~~$\frac{1}{2}$~~ ~~$\frac{9}{4}$~~
 $(-\infty, \frac{1}{2}] \cup (\frac{9}{4}, \infty)$

3. (6pts) Find the domain of the function $f(x) = \frac{\sqrt{3x+11}}{2x-7}$ (in interval notation).

Must have

$$3x+11 \geq 0$$

$$3x \geq -11$$

$$x \geq -\frac{11}{3}$$

Can't have,

$$2x-7=0$$

$$2x=7$$

$$x = \frac{7}{2}$$

~~$-\frac{11}{3}$~~ ~~$\frac{7}{2}$~~

Domain: $[-\frac{11}{3}, \frac{7}{2}) \cup (\frac{7}{2}, \infty)$

4. (14pts) You have \$20,000 to invest and can split this money between an investment bringing 5% interest, and one bringing 6.5% interest. What is the least you need to invest at 6.5% interest in order to meet a goal of annual interest of at least \$1,100?

$x =$ amount invested @ 6.5%

$20000 - x =$ amount invested @ 5%

$$(\text{Interest at 5\%}) + (\text{Interest at 6.5\%}) \geq 1,100$$

$$0.05(20000 - x) + 0.065x \geq 1100$$

$$1000 - 0.05x + 0.065x \geq 1100$$

$$1000 + 0.015x \geq 1100$$

$$x \geq 6666.67$$

$$0.015x \geq 100$$

$$x \geq \frac{100}{0.015}$$

Must invest at least \$ 6666.67
into account giving 6.5% interest,

5. (14pts) Max rows his boat at 6mph in still water. One day he takes a round-trip on a river, taking 2 hours to row downstream, and then 3 hours to row back upstream. What is the speed of the river? How far did Max travel in one direction?

$$\begin{array}{l} \longrightarrow d, 6+r, 2 \text{ hrs} \\ \longleftarrow d, 6-r, 3 \text{ hrs} \end{array} \quad \begin{array}{l} r = \text{speed of river} \\ d = \text{distance traveled downstream (and upstream)} \end{array}$$

$$d = (6+r) \cdot 2 \quad \text{trip downstream}$$

$$d = (6-r) \cdot 3 \quad \text{trip upstream}$$

$$(6+r) \cdot 2 = (6-r) \cdot 3$$

$$12 + 2r = 18 - 3r$$

$$5r = 6$$

$$r = \frac{6}{5} \text{ mph} \quad \begin{array}{l} \text{river's} \\ \text{speed} \end{array}$$

$$d = (6 + \frac{6}{5}) \cdot 2 = \frac{36}{5} \cdot 2 = \frac{72}{5}$$

$$= 14\frac{2}{5} = 14.4 \text{ miles}$$

distance traveled

6. (14pts) How many liters of pure water must be mixed with 4 liters of a 20% solution of sulphuric acid in order to get a 13% solution of sulphuric acid?

$$\begin{array}{|c|} \hline 0\% \text{ sd} \\ \hline x \\ \hline \end{array} + \begin{array}{|c|} \hline 20\% \text{ sd} \\ \hline 4 \\ \hline \end{array} = \begin{array}{|c|} \hline 13\% \text{ sd} \\ \hline x+4 \\ \hline \end{array} \quad \begin{array}{l} x = \text{amount of} \\ \text{water} \end{array}$$

Consider amount of pure sulphuric acid in each container:

$$0 + 0.2 \cdot 4 = 0.13(x+4)$$

$$0.8 = 0.13x + 0.52$$

$$0.13x = 0.28$$

$$x = \frac{0.28}{0.13} = \frac{28}{13} = 2.153846$$

liters of water
must be added,