

Solve the inequalities. Write your solution in interval notation.

1. (5pts) $7 \leq 2x + 3 < 15$ $| -3$

$$4 \leq 2x < 12 \quad | :2$$

$$2 \leq x < 6$$

~~$$\frac{\text{-----}}{2 \qquad \qquad \qquad 6}$$~~

$$[2, 6)$$

2. (7pts) $5 - 4x < -2$ or $1 - 2x > 9$

$$5 - 4x < -2 \quad | -5 \qquad \qquad | -2x > 9 \quad | -1$$

$$-4x < -7 \quad | :(-4) \qquad \qquad -2x > 8 \quad | :(-2)$$

$$x > \frac{7}{4} \qquad \text{or} \qquad x < -4$$

~~$$\frac{\text{-----}}{-4 \qquad \qquad \qquad \frac{7}{4}}$$~~

$$(-\infty, -4) \cup \left(\frac{7}{4}, \infty\right)$$

3. (6pts) Find the domain of the function in interval notation: $f(x) = \frac{\sqrt{2x-5}}{x-4}$.

Must have $2x - 5 \geq 0$ $| +5$

$$2x \geq 5 \quad | :2$$

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

Can't have: $x - 4 = 0$

$$x = 4$$

~~$$\frac{\text{-----}}{\frac{5}{2} \qquad \qquad \qquad 4}$$~~

$$\left[\frac{5}{2}, 4\right) \cup (4, \infty)$$

4. (14pts) Joe, a furniture store employee, can be paid on one of two plans:

A) Salary of \$1050 per month, plus a commission of 10% of sales, or

B) Salary of \$1370 per month, plus a commission of 5% of sales over \$2,000.

Assuming Joe can always sell more than \$2,000, for what level of sales is plan A better?

Solve as an inequality.

$x =$ sales in dollars

$$A(x) = 1050 + 0.10 \cdot x$$

$$B(x) = 1370 + 0.05(x - 2000)$$

A is better when $A(x) \geq B(x)$

$$1050 + 0.10x \geq 1370 + 0.05(x - 2000)$$

$$1050 + 0.10x \geq 1370 + 0.05x - 100 \quad | -0.05x - 1050$$

$$0.05x \geq 220$$

$$x \geq \frac{220}{0.05}$$

$$x \geq 4400$$

A is better if sales are

4400 or more.

5. (14pts) On a drive to Paducah you take the scenic route and drive at average speed 45 mph. On your return, you take a road that is 10 miles longer, but since you drive at average speed 55 mph, it takes you 3 minutes shorter than the trip to Paducah.

a) How long did you drive to Paducah?

b) How far did you travel to Paducah?

$$\begin{array}{c} \xrightarrow{d, 45, t} \\ \xleftarrow{d+10, 55, t-\frac{3}{60}} \end{array}$$

$$\begin{cases} d = 45t \\ d+10 = 55\left(t - \frac{1}{20}\right) \end{cases}$$

$$45t + 10 = 55\left(t - \frac{1}{20}\right)$$

$$45t + 10 = 55t - \frac{55}{20} \quad | -45t + \frac{55}{20} \quad \approx 2.75$$

$$12.75 = 10t$$

$$t = 1.275 \text{ hrs (76.5 minutes)}$$

a) It took 1.275 hours

b) $d = 45 \cdot 1.275$

$$= 57.375 \text{ miles}$$

Distance to Paducah.

6. (14pts) How many liters of a 4% solution of hydrochloric acid must be mixed with 7 liters of a 17% solution of hydrochloric acid in order to get a 12% solution of hydrochloric acid?

$$\begin{array}{ccc} x \text{ liters} & 7 \text{ liters} & x+7 \text{ liters} \\ 4\% & 17\% & 12\% \\ \boxed{} & + \boxed{} & = \boxed{} \end{array}$$

$$0.04x + 0.17 \cdot 7 = 0.12(x+7)$$

Amount of hydrochloric acid in each vessel.

$$0.04x + 1.19 = 0.12x + 0.84 \quad | -0.04x - 0.84$$

$$0.35 = 0.08x$$

$$x = \frac{0.35}{0.08} = 4.375$$

Add 4.375 liters

of the 4% solution.