Solve the inequalities. Write your solution in interval notation.

1. (5pts) $-2 \leq 3x - 4 < 8$ $|+4$

$$2 \leq 3x < 12$$
$$\frac{2}{3} \leq x < 4$$
$$\left[\frac{2}{3}, 4\right)$$

2. (7pts) $3x - 1 \leq 5$ or $2x + 7 > 18$

$$3x - 1 \leq 5 \quad \text{or} \quad 2x + 7 > 18$$
$$3x \leq 6 \qquad\qquad 2x > 11$$
$$x \leq 2 \qquad\qquad x > \frac{11}{2}$$

$$(-\infty, 2] \cup \left(\frac{11}{2}, \infty\right)$$

3. (6pts) Find the domain of the function in interval notation: $f(x) = \dfrac{\sqrt{4 - 5x}}{2x + 15}$.

Must have: Can't have

$4 - 5x \geq 0$ $2x + 15 = 0$

$4 \geq 5x$ $2x = -15$

$x \leq \frac{4}{5}$ $x = -\frac{15}{2}$

$$\left(-\infty, -\frac{15}{2}\right) \cup \left(-\frac{15}{2}, \frac{4}{5}\right]$$

4. (14pts) For her birthday, Christa is considering renting an event venue. Her choices are Party Pad, which charges $100 per event plus $40 per hour, or Fiesta Flat, which charges $200, which includes two hours, and then $30 per hour for every hour after the first two. Christa plans her party to last at least two hours. For which number of hours is Party Pad the better option for her?

$x =$ number of hours
   Christa rents

Party Pad cost $= 100 + 40x$

Fiesta Flat cost $= 200 + 30(x-2)$

Party Pad is better when

$100 + 40x \leq 200 + 30(x-2)$

$100 + 40x \leq 140 + 30x$

$10x \leq 40$

$x \leq 4$

Party Pad is better for
rentals up to 4 hours.

5. (14pts) A 250-mile-long road joins cities Frogtown and Snakeville. At the same time, one car leaves Frogtown and drives toward Snakeville, and another car, driving 11mph faster than the first car, leaves Snakeville and drives toward Frogtown. After 2 hours they meet on the road.

a) What are the speeds of the cars?
b) How far from Frogtown did they meet?

$d_1, r, 2\,hrs \qquad d_2, r+11, 2hrs$

$F \quad\text{meeting point}\quad S$

$250\,mi$
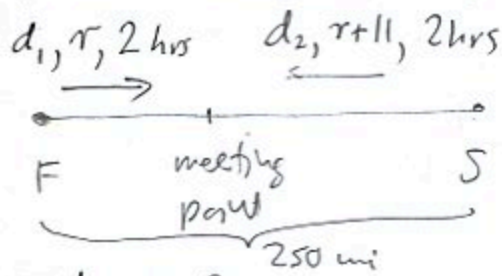
$d_1 = r \cdot 2$

$d_2 = (r+11) \cdot 2$

$d_1 + d_2 = 250$

$2r + 2(r+11) = 250$

$4r + 22 = 250$

$4r = 228$

$r = 57\,mph$

a) First car travels at 57 mph
Second car travels at 68 mph

b) They meet $57 \cdot 2 = 114$ miles from Frogtown

6. (14pts) How many liters of a 10% solution of hydrobromic acid must be mixed with 7 liters of a 25% solution of hydrobromic acid in order to get a 19% solution of hydrobromic acid?

$\boxed{\begin{array}{c}10\%\ sol\\ x\end{array}} + \boxed{\begin{array}{c}25\%\ sol\\ 7\end{array}} = \boxed{\begin{array}{c}19\%\\ x+7\end{array}}$

$x = $ amount of 10% solution needed

compare amounts of pure acid

$0.10x + 0.25 \cdot 7 = 0.19(x+7)$

$0.1x + 1.75 = 0.19x + 1.33$

$0.42 = 0.09x$

$x = \dfrac{0.42}{0.09} = \dfrac{42}{9} = \dfrac{14}{3}$ liters $= 4.666667\,\ell$