Solve the inequalities. Write your solution in interval notation.

1. (5pts) $-3 \le 9 - 4x < 5$ | -9
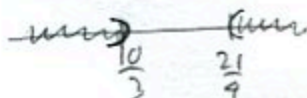
$-12 \le -4x < -4$ | $\div (-4)$

$3 \ge x > 1$

$(1, 3]$

2. (7pts) $3x - 5 < 5$ or $4x - 6 > 15$

$3x < 10$ $\qquad$ $4x > 21$

$x < \frac{10}{3}$ or $x > \frac{21}{4}$

$\left(-\infty, \frac{10}{3}\right) \cup \left(\frac{21}{4}, \infty\right)$

3. (6pts) Find the domain of the function in interval notation: $f(x) = \dfrac{\sqrt{5x+8}}{2x-5}$.
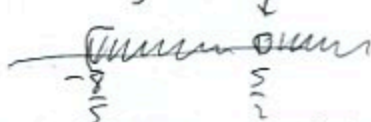
Must have: $5x + 8 \ge 0$ $\qquad$ Can't have $2x - 5 = 0$

$5x \ge -8$ $\qquad\qquad\qquad$ $2x = 5$

$x \ge -\frac{8}{5}$ $\qquad$ exclude. $x = \frac{5}{2}$

$\left[-\frac{8}{5}, \frac{5}{2}\right) \cup \left(\frac{5}{2}, \infty\right)$

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? Solve as an inequality.

$x =$ length of party in hours

Party Pad cost: $100 + 40x$
Fiesta Flat cost: $200 + 30(x-2)$

Party Pad is cheaper when

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

$100 + 40x < 200 + 30x - 60$ | $-30x$, -100

$10x \le 40$ | $\div 10$

$x \le 4$

For parties up to 4 hours,
Party Pad is better.

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.
a) What is the speed of the river?
b) How far did Max travel in one direction?

$d, 6+r, 2$ →

$d, 6-r, 3$ ←

$r = $ speed of river in mph

a) speed of river $= 1.2$ mph

b) $d = (6 + 1.2) \cdot 2 = 14.4$ miles

same $\begin{cases} d = (6+r) \cdot 2 \\ d = (6-r) \cdot 2 \end{cases}$

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

$12 + 2r = 18 - 3r$

$5r = 6$

$r = \dfrac{6}{5} = 1.2$ mph

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?

$\left[\begin{matrix} x \\ 0\% \end{matrix}\right] + \left[\begin{matrix} 4\ell \\ 20\% \end{matrix}\right] = \left[\begin{matrix} x+4 \\ 13\% \end{matrix}\right]$

$x = $ liters of pure water

$0 + 0.20 \cdot 4 = 0.13(x+4)$ $\quad \begin{cases} \text{amounts of pure} \\ \text{sulphuric acid} \\ \text{in each container} \end{cases}$

$0.8 = 0.13x + 0.52$

$0.28 = 0.13x$

$x = \dfrac{0.28}{0.13} = 2.153846$ liters