Solve the inequalities. Write your solution in interval notation.

1. (5pts) $-3 \le 5x + 7 < 9$ $\quad |-7$

$-10 \le 5x < 2 \quad |\div 5$

$-2 \le x < \frac{2}{5}$

$[-2, \frac{2}{5})$

2. (7pts) $2x + 1 < 3$ or $2x + 5 > 11$ $\quad |-5$

$-1 | \quad 2x < 2 \qquad 2x > 6 \qquad |\div 2$

$\div 2 | \quad x < 1 \quad$ or $\quad x > 3$

$(-\infty, 1) \cup (3, \infty)$

3. (6pts) Find the domain of the function in interval notation: $f(x) = \dfrac{\sqrt{3 - 2x}}{4x + 7}$.
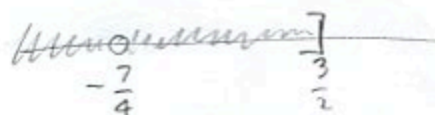
Must have

$3 - 2x \ge 0$

$3 \ge 2x \quad |\div 2$

$\frac{3}{2} \ge x$

Can't have

$4x + 7 = 0 \quad |-7$

$4x = -7$

$x = -\frac{7}{4}$

$-\frac{7}{4} \qquad \frac{3}{2}$

$(-\infty, -\frac{7}{4}) \cup (-\frac{7}{4}, \frac{3}{2}]$

4. (14pts) Landscaping services Bob's Dirt and Duncan's Lawns are offering spring yard cleanup services. Bob's Dirt charges \$50 plus \$45 per hour and Duncan's Lawns charges \$200, which includes the first three hours, plus \$35 per hour for every hour after the first three. Assuming your yard needs at least three hours of work, for which number of hours is Duncan's Lawns the better option? Solve as an inequality.

$x =$ no of hours needed, $x \ge 3$

Bob's Dirt cost: $\quad 50 + 45x$

Duncan's Lawn cost: $\quad 200 + 35(x-3)$

Wish to find for which x

$200 + 35(x-3) \le 50 + 45x$

$200 + 35x - 105 \le 50 + 45x \quad |-35x$

$95 \le 50 + 10x \quad |-50$

$45 \le 10x$

$4.5 \le x$

For jobs that need more than 4.5 hrs of work, Duncan's is the better option (cheaper)

5. (14pts) The distance between Murray and Nashville is 121 miles. Celia drives from Murray towards Nashville. Driving along the same road and starting at the same time, her friend Dana drives from Nashville towards Murray, driving 4mph faster than Celia. After 55 minutes, they meet on the road.
a) How fast was each of them driving?
b) How far from Murray did the friends meet?

Murray — Celia $\to$ • $\leftarrow$ Dana — Nashville

$d_1, r,\ 55\,mn$ $d_2, r+4,\ 55\,mi$

$\longleftarrow$ 121 $\longrightarrow$
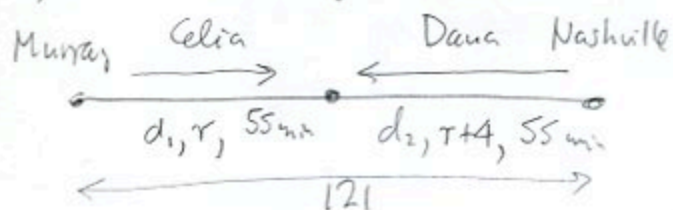
$55\,mn = \dfrac{55}{60}\,hr$

$d_1 = r \cdot \dfrac{55}{60} = r \cdot \dfrac{11}{12}$

$d_2 = (r+4)\dfrac{55}{60} = (r+4)\dfrac{11}{12}$

$d_1 + d_2 = 121$ so

$r \cdot \dfrac{11}{12} + (r+4)\dfrac{11}{12} = 121$

$\dfrac{11}{12}(r + r + 4) = 121 \quad \Big|\cdot \dfrac{12}{11}$

$2r + 4 = \dfrac{\overset{11}{121} \cdot 12}{\underset{1}{11}}$

$2r + 4 = 132 \qquad |-4$

$2r = 128 \qquad |\div 2$

$r = 64\ mph$

a) Celia drives at 64 mph
   Dana drives at 68 mph

b) $d_1 = \overset{16}{64} \cdot \dfrac{11}{\underset{3}{12}} = \dfrac{176}{3} = 58\dfrac{2}{3}$ miles from Murray

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6. (14pts) Friends Tim, Josh and Kathy go out to lunch and split the total cost of $28.68. Tim pays four fifths of the amount Josh pays and Kathy pays $1.25 more than Tim. How much did each of them pay?

$x =$ amount Josh pays

$\dfrac{4}{5}x =$ amount Tim pays

$\dfrac{4}{5}x + 1.25 =$ amount Kathy pays
   (Tim + 1.25)

Total is 28.68, so

$x + \dfrac{4}{5}x + \dfrac{4}{5}x + 1.25 = 28.68 \quad |-1.25$

$\left(\dfrac{5}{5} + \dfrac{4}{5} + \dfrac{4}{5}\right)x = 27.43$

$\dfrac{13}{5}x = 27.43 \quad \Big|\cdot \dfrac{5}{13}$

$x = 27.43 \cdot \dfrac{5}{13} = 10.55$

Josh pays $10.55

Tim pays $8.44

Kathy pays $9.69