College Algebra — Joysheet 4
MAT 140, Spring 2021 — D. Ivanšić

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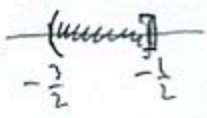
Covers: 1.5, 1.6 *Show all your work!*

Solve the inequalities. Write your solution in interval notation.

1. (5pts) $7 < 2x + 10 \leq 9$

$-3 < 2x \leq -1 \quad | \div 2$

$-\frac{3}{2} < x \leq -\frac{1}{2}$

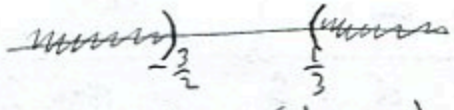


$\left(-\frac{3}{2}, -\frac{1}{2}\right]$

2. (7pts) $2 - 3x < 1$ or $7 - 2x > 10$

$-3x < -1 \quad | \div(3) \qquad -2x > 3 \quad | \div 2$

$x > \frac{1}{3} \quad$ or $\quad x < -\frac{3}{2}$



$\left(-\infty, -\frac{3}{2}\right) \cup \left(\frac{1}{3}, \infty\right)$

3. (6pts) Find the domain of the function in interval notation: $f(x) = \dfrac{\sqrt{4-9x}}{x^2 - 5x - 6}$.

Must have: $4 - 9x \geq 0$

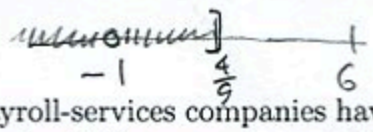
$-9x \geq -4$

$x \leq \frac{4}{9}$

Can't have $x^2 - 5x - 6 = 0$

$(x+1)(x-6) = 0$

$x = -1, 6$



Domain: $(-\infty, -1] \cup \left(-1, \frac{4}{9}\right]$

4. (14pts) Two payroll-services companies have the following monthly cost structures. Jiffy Pay charges a \$300 plus \$10 per employee and Sally's Salary charges \$500 per month, which includes the first 50 employees, and then \$12 per employee beyond 50. Assuming a business has more than 50 employees, for which number of employees is Jiffy Pay a better deal? Solve as an inequality.

x = number of employees, $x > 50$

Jiffy Pay cost for x employees: $300 + 10x$

Sally's Salary : $500 + 12(x - 50)$

Wish to have Jiffy Pay cost $\leq$ Sally's Salary cost

$300 + 10x \leq 500 + 12(x - 50)$

$300 + 10x \leq 500 + 12x - 600 \quad | -10x + 100$

$400 \leq 2x$

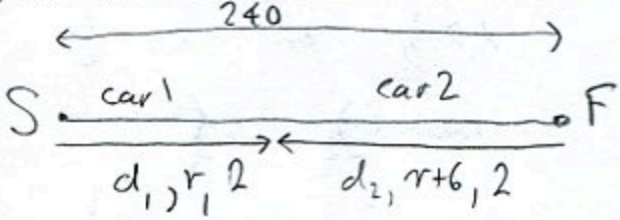
$200 \leq x$

Business needs to have at least 200 employees for Jiffy Pay to be a better deal.

5. (14pts) A 240-mile-long road joins cities Snowden and Flakeville. At the same time, one car leaves Snowden and drives toward Flakeville, and another car, driving 6mph faster than the first car, leaves Flakeville and drives toward Snowden. After 2 hours they meet on the road.

a) What are the speeds of the cars?

b) How far from Snowden did they meet?



$d_1 = r \cdot 2$

$d_2 = (r+6) \cdot 2$

$d_1 + d_2 = 240$

$2r + 2(r+6) = 240$

$2r + 2r + 12 = 240$

$4r = 228$

$r = 57 \text{ mph}$

a) Car from Snowden: 57 mph

Car from Flakeville: 63 mph

b) d_1 = distance from Snowden

$= 57 \cdot 2 = 114$ miles

6. (14pts) An elementary school has 6 more girls than boys among students. Students are divided so that every teacher teaches 18 students. If the total number of students and teachers is 266, how many girls, boys and teachers does the school have?

x = number of boys in school

$x+6$ = " girls in "

$\frac{x+x+6}{18}$ = number of teachers in school

boys + girls + teachers = 266

$x + x+6 + \frac{x+x+6}{18} = 266$

$2x+6 + \frac{2x+6}{18} = 266 \quad | \cdot 18$

$18(2x+6) + 2x+6 = 4788$

$36x + 108 + 2x + 6 = 4788$

$38x + 114 = 4788 \quad | -114$

$38x = 4674$

$x = \frac{4674}{38} = 123$

123 boys, 129 girls, 14 teachers

$\frac{2 \cdot 123 + 6}{18} = 14$