

1. (5pts) Solve the equations.

$$3x - (x + 4) = 5(x - 8) + 3$$

$$3x - x - 4 = 5x - 40 + 3$$

$$2x - 4 = 5x - 37 \quad | -2x$$

$$-4 = 3x - 37 \quad | +37$$

$$33 = 3x \quad | \div 3$$

$$x = \frac{33}{3} = 11$$

$$2 + \frac{6x+1}{x-4} = \frac{7x-3}{x-4} \quad | \cdot (x-4)$$

$$2(x-4) + \frac{6x+1}{\cancel{x-4}} \cdot \cancel{(x-4)} = \frac{7x-3}{\cancel{x-4}} \cdot \cancel{(x-4)}$$

$$2x - 8 + 6x + 1 = 7x - 3$$

$$8x - 7 = 7x - 3 \quad | -7x$$

$$x = 4$$

Putting into original equation gives
0 in denominator, so no solution.

2. (6pts) Solve the equations.

$$2x^2 - 3x = x^2 + x + 21$$

$$x^2 - 4x - 21 = 0 \quad \begin{array}{l} \text{prod} = -21 \\ \text{sum} = -4 \end{array} \quad -7, 3$$

$$(x-7)(x+3) = 0$$

$$x = 7 \text{ or } x = -3$$

$$3x^2 = 6x - 8$$

$$3x^2 - 6x + 8 = 0$$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4 \cdot 3 \cdot 8}}{2 \cdot 3} = \frac{6 \pm \sqrt{36 - 96}}{6}$$

$$= \frac{6 \pm \sqrt{-60}}{6} = \frac{6 \pm i \cdot 2\sqrt{15}}{6} = \frac{2(3 \pm i\sqrt{15})}{6} = \frac{3 \pm i\sqrt{15}}{3}$$

$$60 = 4 \cdot 15$$

3. (3pts) Solve by completing the square.

$$x^2 + 8x - 9 = 0$$

$$x^2 + 2x \cdot 4 - 9 = 0 \quad | + 4^2$$

$$x^2 + 2 \cdot x \cdot 4 + 4^2 - 9 = 4^2$$

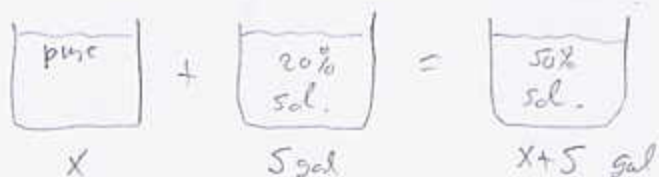
$$(x+4)^2 = 16 + 9$$

$$(x+4)^2 = 25$$

$$x+4 = \pm 5$$

$$x = -4 \pm 5 = -9, 1$$

4. (8pts) How many gallons of pure alcohol must be mixed with 5 gallons of a 20% alcohol solution in order to get a 50% alcohol solution?



$x =$ gallons of pure alcohol

$$x + 0.2 \cdot 5 = 0.5(x + 5)$$

$$x + 1 = 0.5x + 2.5 \quad | -0.5x$$

$$0.5x = 1.5$$

$$x = \frac{1.5}{0.5} = 3 \text{ gals}$$

5. (8pts) An airplane averages an airspeed of 130mph. Due to a constant wind, it takes the plane 2 hours to fly to a place, but only 1hr and 15 minutes to return from it.

a) Find the wind speed.

b) Find how far the plane flew one-way.

a) Let $v =$ wind speed.

$$v = \frac{97.5}{3.25} = 30 \text{ mph}$$

Trip there Trip back

Wind speed is 30 mph

$$d = (130 - v) \cdot 2 \quad d = (130 + v) \cdot 1.25$$

1hr 15 min = 1.25 hr.

$$b) d = (130 - 30) \cdot 2 = 200 \text{ miles}$$

Since trips are equal:

$$(130 - v) \cdot 2 = (130 + v) \cdot 1.25$$

$$260 - 2v = 162.5 + 1.25v \quad | +2v$$

$$97.5 = 3.25v$$