

## Math 80 Worksheet #6

1. Solve the following equations:

(a)  $x^2 + x - 42 = 0$

Factoring the left side of the equation:  $(x + 7)(x - 6) = 0$

$$\text{Either } x + 7 = 0 \text{ or } x - 6 = 0. \Rightarrow x = -7 \text{ or } x = 6$$

(b)  $2a^2 - 7a + 3 = 0$

Factoring the left side of the equation:  $(2x - 1)(x - 3) = 0$

$$\text{Either } 2x - 1 = 0 \text{ or } x - 3 = 0. \Rightarrow x = \frac{1}{2} \text{ or } x = 3$$

(c)  $5t^2 + 15t = 0$

Factoring the left side of the equation:  $5t(t + 3) = 0$  (GCF =  $5t$ )

$$\text{Either } 5t = 0 \text{ or } t + 3 = 0. \Rightarrow t = 0 \text{ or } t = -3$$

(d)  $m(m - 1) = 5m - 5$

Simplifying each side:  $m^2 - m = 5m - 5$

Putting in standard form:  $m^2 - 6m + 5 = 0$

Factoring the left side of the equation:  $(m - 5)(m - 1) = 0$

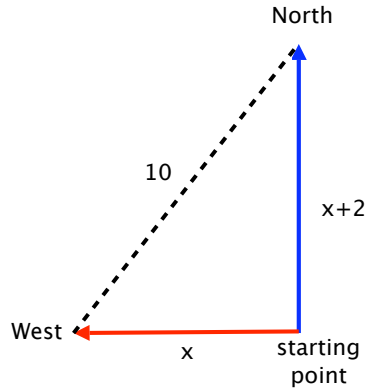
$$\text{Either } m - 5 = 0 \text{ or } m - 1 = 0. \Rightarrow m = 5 \text{ or } m = 1$$

2. Two cars leave an intersection at the same time. One car is heading north and the other is heading west. At a particular instant, the distance that the northbound car has traveled is 2 miles further than the distance that the westbound car has traveled. At this time, the cars are 10 apart. How far has the northbound car traveled from the intersection?

**Unknowns:** Distance traveled by westbound car =  $x$

Distance traveled by northbound car =  $x + 2$

We have the following beautiful diagram:



Using the pythagorean theorem, we have  $x^2 + (x + 2)^2 = 10^2$

$$\begin{aligned} \Rightarrow x^2 + x^2 + 4x + 4 &= 100 \\ \Rightarrow 2x^2 + 4x - 96 &= 0 \quad (\text{Standard Form}) \\ \Rightarrow x^2 + 2x - 48 &= 0 \quad (\text{Dividing both sides by 2}) \\ \Rightarrow (x + 8)(x - 6) &= 0 \quad (\text{Factoring}) \end{aligned}$$

So, either  $x = -8$  or  $x = 6$ . Since the distance traveled is positive, we have that  $x = 6$ .

**The westbound car traveled 6 miles and the northbound car traveled 8 miles.**

3. Evaluate the rational expression  $\frac{4y-x}{x^2+2y}$  when  $x = 2$  and  $y = -1$ .

Plugging in the values  $x = 2$  and  $y = -1$ :  $\frac{4(-1)-2}{2^2+2(-1)} = \frac{-4-2}{4-2} = \frac{-6}{2} = -3$

4. For what values of  $x$  are the following expressions undefined?

(a)  $\frac{3}{x}$

The expression is undefined when  $x = 0$ .

(b)  $\frac{5x}{3x-6}$

The expression is undefined when  $3x - 6 = 0$ .

$$3x - 6 = 0 \Rightarrow 3x = 6 \Rightarrow x = 2$$

So, the expression is undefined when  $x = 2$ .

(c)  $\frac{1-x}{x^2-9x+18}$

The expression is undefined when  $x^2 - 9x + 18 = 0$ .

$$x^2 - 9x + 18 = 0 \Rightarrow (x - 3)(x - 6) = 0 \Rightarrow x = 3 \text{ or } x = 6$$

So, the expression is undefined when  $x = 3$  or  $x = 6$ .

(d)  $\frac{20-x^4}{3}$

There are no values for which this expression is undefined because the numerator is never equal to zero.