

These problems will be collected at the end of class today. You will definitely need to study more topics than this activity covers. This is for you to get graded feedback from your instructor. Each problem, unless otherwise noted, is worth 3 points. The total value of this exercise is 25 points.

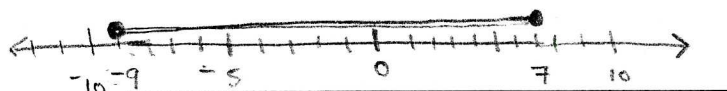
Instructions: Show all work for full credit. Poor notation or sloppy work will be penalized. Point values as indicated.

1. Solve the following inequalities.

$$(a) \left| \frac{x+1}{2} \right| \leq 4 \quad -4 \leq \frac{x+1}{2} \leq 4$$

$$-8 \leq x+1 \leq 8$$

$$-9 \leq x \leq 7$$



$$(b) \frac{3}{x-1} - \frac{4}{x} \geq 1 \quad (\text{Warning: Do not multiply inequalities by expressions with variables, since this will change the sign.})$$

$$\frac{3}{x-1} - \frac{4}{x} - 1 \geq 0$$

Note: undefined at $x = 0, 1$

$$\text{Solve } \frac{3}{x-1} - \frac{4}{x} - 1 = 0$$

$$3x - 4(x-1) - x(x-1) = 0$$

$$3x - 4x + 4 - x^2 + x = 0$$

$$-x^2 + 4 = 0$$

$$x^2 = 4$$

$$x = \pm 2 \quad \text{zero's at } x = \pm 2$$

$$\text{Test points in } \frac{3}{(x-1)} - \frac{4}{x} - 1$$

$$x = -3 : \frac{3}{-3-1} - \frac{4}{-3} - 1 = -\frac{3}{4} + \frac{4}{3} - 1 = \frac{-5}{12} < 0$$

$$x = -1 : \frac{3}{(-1-1)} - \frac{4}{-1} - 1 = -\frac{3}{2} + 4 - 1 = \frac{3}{2} > 0$$

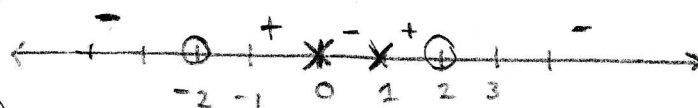
Test

$$x = \frac{1}{2} : \frac{3}{(\frac{1}{2}-1)} - \frac{4}{\frac{1}{2}} - 1 = -6 - 8 - 1 = -15 < 0$$

$$x = \frac{3}{2} : \frac{3}{(\frac{3}{2}-1)} - \frac{4}{\frac{3}{2}} - 1 = \frac{3}{\frac{1}{2}} - \frac{8}{3} - 1$$

$$= 6 - \frac{8}{3} - 1 = \frac{7}{3} > 0$$

$$x = 3 : \frac{3}{(3-1)} - \frac{4}{3} - 1 = \frac{3}{2} - \frac{4}{3} - 1 = \frac{9-8-6}{6} = \frac{-5}{6} < 0$$



$$[-2, 0) \cup (1, 2]$$

2. Solve for x . (Warning: You MUST check your answer if you square both sides of an equation or 'cross multiply' by a variable expression.)

(a) $2x^2 + 13x = 7$

$$2x^2 + 13x - 7 = 0$$

$$(2x - 1)(x + 7) = 0$$

$$2x - 1 = 0$$

$$x = \frac{1}{2}$$

or

$$x + 7 = 0$$

$$x = -7$$

$$\boxed{x = \frac{1}{2}, -7}$$

(b) $\sqrt{5-x} + 1 = x - 2$

$$\sqrt{5-x} = x - 3$$

$$5-x = (x-3)^2$$

$$5-x = x^2 - 6x + 9$$

$$0 = x^2 - 5x + 4$$

$$0 = (x-4)(x-1)$$

$$x = 4, 1$$

check: $x = 4: \sqrt{5-4} + 1 = 4 - 2$ ✓

$x = 1: \sqrt{5-1} + 1 = 1 - 2$ No 3 ≠ -1

$$\boxed{x = 4}$$

3. Solve. (Warning: You MUST define your variables.)

- (a) Suppose you invest \$10,000 for three years, and earn a total of \$1050 in interest. Assuming the interest is compounded simply, what was the interest rate on this account?

$$I = Prt$$

$I = \text{Interest}$ $P = \text{Principal}$ $r = \text{rate}$ $t = \text{time in years}$

$$\$1050 = (\$10,000)r(3)$$

$$r = \frac{1050}{(10,000)(3)} = 350 \times 10^{-4} = .035$$

$$\boxed{r = .035 \text{ or } 3.5\%}$$

- (b) Mary makes a salary that is 15% larger than her spouse George's salary. Together their household income is \$86,000. What is Mary's salary?

Let $g = \text{George's annual salary}$

Then Mary's salary is $1.15g = (1 + .15)g$

Together this couple earns

$$\$86,000 = g + 1.15g$$

Solve $86,000 = 2.15g$

$$\frac{86,000}{2.15} = g$$

$$g = 40,000$$

The question was for Mary's salary

$$1.15g = 1.15(40,000) = \boxed{\$46,000}$$

- (c) (4 pts. total - 2 pts. each) A new snow machine costs \$15,000 and depreciates at an annual rate of \$2000 per year.

i. Express the value V of the snow machine as a function of time t in years.

$$V = 15,000 - 2000t \quad \text{dollars}$$

ii. Give the V -intercept and explain its meaning.

The V -intercept is \$15,000 and represents the purchase price

4. Find the radius and center of the circle with equation

$$3x^2 + 3y^2 - 6x + 3y - \frac{1}{4} = 0$$

$$3x^2 - 6x + 3y^2 + 3y = \frac{1}{4}$$

$$3(x^2 - 2x) + 3(y^2 + y) = \frac{1}{4}$$

$$3(x-1)^2 + 3(y+\frac{1}{2})^2 = \frac{1}{4} + 3 + \frac{3}{4}$$

$$3(x-1)^2 + 3(y+\frac{1}{2})^2 = 4$$

$$\begin{matrix} \uparrow & \uparrow & \nwarrow \\ (x-1)^2 + (y+\frac{1}{2})^2 = \frac{4}{3} & & R^2 \end{matrix}$$

Center: $\boxed{(1, -\frac{1}{2})}$

$$R = \sqrt{\frac{4}{3}} = \boxed{\frac{2\sqrt{3}}{3}}$$