

VB

S/P/B

Name KEY

1. Solve for x.

a.  $\frac{2x-6}{x} = \frac{x-3}{x+1}$

$$(2x-6)(x+1) = x(x-3)$$

$$2x^2 - 4x - 6 = x^2 - 3x$$

$$x^2 - x - 6 = 0$$

$$(x-3)(x+2) = 0$$

$$x \in \{-2, 3\}$$

S/P/B

b.  $|x+3| = 6$

$$x+3 = \pm 6$$

$$x = -3 \pm 6$$

$$x \in \{3, -9\}$$

S/P/B

c.  $|x+3| \leq 6$

$$x+3 \leq 6 \text{ AND } x+3 \geq -6$$

$$\{x \mid x \leq 3 \text{ AND } x \geq -9\}$$

$$= [-9, 3]$$

S/P/B

2. If I buy a 2012 Cummins Diesel for \$43,000 and that price includes 8% sales tax, then how much does the truck cost *before* sales tax?

Let  $x = \text{Price before tax}$

Then  $x + .08x = 43000$

$$1.08x = 43000$$

$$x = \frac{43000}{1.08} \approx 39814.81$$

39814.81481

100%

3. Jim can paint the room in 8 hours. It takes Jenny 6 hours to paint the room. How long does it take the two of them to paint the room if they work together?  $x = \text{time together working (hrs)}$

$$\frac{1}{8}x + \frac{1}{6}x = 1$$

$$\frac{6x + 8x}{48} = \frac{48}{48}$$

$$14x = 48$$

$$x = \frac{48}{14} = \frac{24}{7} \approx 3.428571429 \text{ hrs}$$

100%

4. Suppose Jim shows up at 11 a.m. (3 hours late!) and Jenny's been painting the room for 3 hours, already. When is the paint job finished? Give your answer to the nearest minute, for full credit.

Let  $x = \text{time Jenny spends working (hrs)}$

Then

$$\frac{1}{6}x + \frac{1}{8}(x-3) = 1$$

$$\frac{8x + 6(x-3)}{48} = \frac{48}{48}$$

$$8x + 6x - 18 = 48$$

$$14x = 66$$

$$x = \frac{66}{14} \approx 4.714285714$$

$$\approx 4 + (.7142857 \text{ hr}) \left( \frac{60 \text{ min}}{\text{hr}} \right)$$

$$= 4 + 42.857 \text{ min.}$$

$$8 \text{ am} + 4 \text{ hrs} + 43 \text{ min}$$

$$= 12:43 \text{ pm}$$

50%

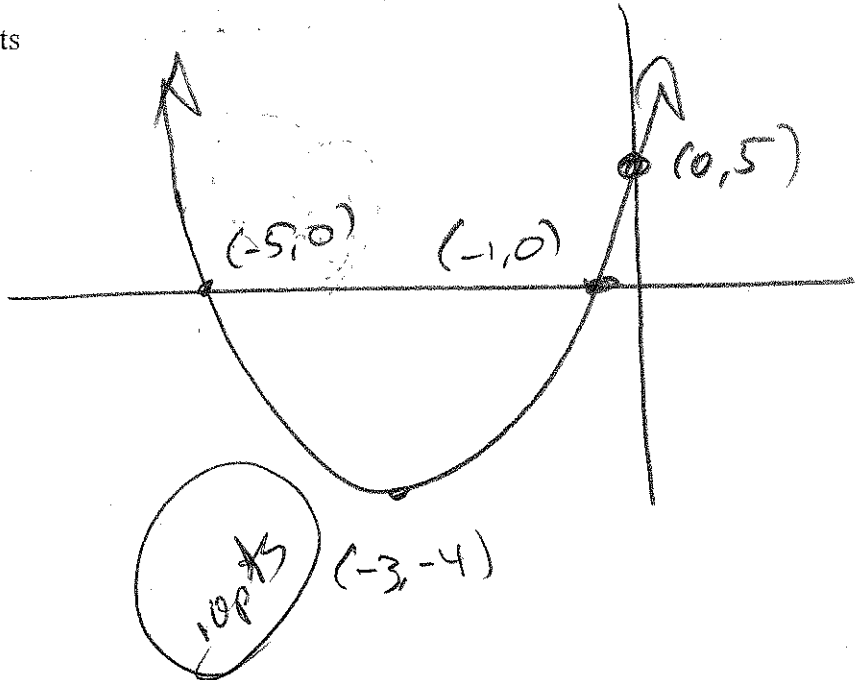
5. Write the quadratic function  $f(x) = x^2 + 6x + 5$  in the form  $y = a(x-h)^2 + k$  and sketch its graph. Your graph should be "true to the essence of the parabola" and include the following points, clearly labeled as ordered pairs on the graph (and this is the last time I'm telling you how to label key points).

- i. Vertex
- ii. Any x- and y-intercepts

$$\begin{aligned}
 & x^2 + 6x + 5 \\
 = & x^2 + 6x + 3^2 - 9 + 5 \\
 = & (x+3)^2 - 4 \\
 (h, k) = & (-3, -4)
 \end{aligned}$$

$$\begin{aligned}
 \text{Set } 0 & \Rightarrow \\
 (x+3)^2 & = 4 \\
 x+3 & = \pm 2 \\
 x & = -3 \pm 2 \Rightarrow \begin{cases} -1 \\ -5 \end{cases}
 \end{aligned}$$

$$x \in \{-5, -1\}$$



6. Write an equation of the line through the points  $P(1, 6)$  and  $Q(-3, 9)$ . Express the equation in all three forms:

a. Point-Slope  $m = \frac{9-6}{-3-1} = \frac{3}{-4} = -\frac{3}{4}$

$$\begin{aligned}
 & \boxed{y = -\frac{3}{4}(x-1) + 6} \\
 & = -\frac{3}{4}x + \frac{3}{4} + \frac{24}{4}
 \end{aligned}$$

5pts

b. Slope-Intercept

$$\boxed{y = -\frac{3}{4}x + \frac{27}{4}}$$

$$4y = -3x + 27$$

c. Standard

$$\boxed{3x + 4y = 27}$$

7. Write an equation in point-slope form of the line through  $P(4, 3)$  that is parallel to the line  $y = \frac{3}{4}x + \frac{11}{97}$

$$y = \frac{3}{4}(x-4) + 3 \quad \text{SPB} = \frac{3}{4}x$$

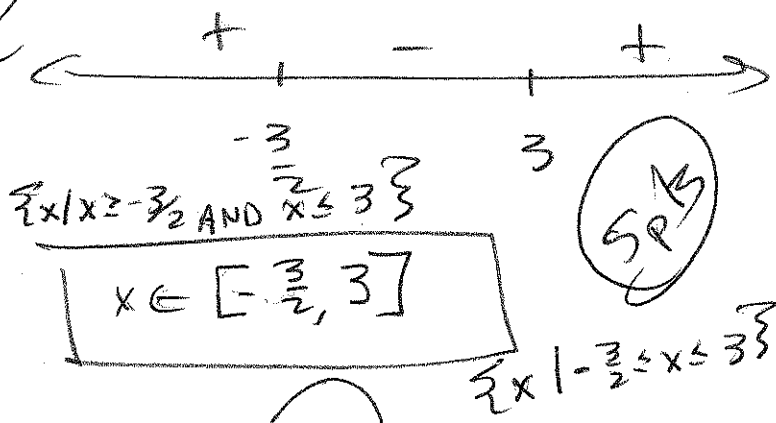
8. Solve for  $x$ :

a.  $2x^2 - 3x - 9 = 0$

b.  $2x^2 - 3x - 9 \leq 0$

$$(2x+3)(x-3) = 0 \quad \text{SPB}$$

$$x \in \left\{ -\frac{3}{2}, 3 \right\}$$



9. Let  $f(x) = \frac{x+3}{x-8}$  and  $g(x) = \sqrt{x+5}$ .

a. What is the domain of  $f$ ?

$$\{x \mid x \neq 8\} \quad \text{SPB} \quad (-\infty, 8) \cup (8, \infty)$$

b. What is the domain of  $g$ ?

$$\{x \mid x \geq -5\} \quad \text{SPB}$$

c. What is  $f \circ g$  and what is its domain?

$$(f \circ g)(x) = \frac{\sqrt{x+5} + 3}{\sqrt{x+5} - 8} \quad \text{SPB}$$

Sentinel

$$\mathcal{D} = \{x \mid x \geq -5 \text{ and } \sqrt{x+5} \neq 8\}$$

$$= \{x \mid x \geq -5 \text{ and } x \neq 59\}$$

$$= [-5, 59) \cup (59, \infty)$$