

## Pre-requisite Skills for Pre-Calculus

The following questions reflect skills from Algebra I and Algebra II that are pre-requisite skills for Pre-Calculus. Solutions and work are posted online, as well as links to videos that solve the problems. Your pre-calculus teacher will not be re-teaching these skills in class, but extra help will be available after school. You will be assessed on these skills during the first week of the class.

**All answers should be given in fully simplified form.**

1. Determine the equation of the line:

a) through (-1,3) and (2,-4)

$$m = \frac{3 - (-4)}{-1 - 2} = -\frac{7}{3}$$

$$y - 3 = -\frac{7}{3}(x + 1)$$

$$y = -\frac{7}{3}x + \frac{2}{3}$$

b) through (-1,2) and perpendicular to  $2x - 3y + 5 = 0$

$$2x - 3y + 5 = 0$$

$$3y = 2x + 5$$

$$m = \frac{2}{3}$$

The slope of the line perpendicular to  $2x - 3y + 5 = 0$  is  $-\frac{3}{2}$

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

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

c) through (2,3) and the midpoint of the line segment from (-1,4) to (3,2)

Midpoint of the line segment from (-1,4) to (3,2) is (1,3)

$$m = \frac{3 - 3}{2 - 1} = 0$$

$$y = 3$$

2. Simplify:

$$a) \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

$$b) \frac{3}{5+\sqrt{7}} = \frac{3}{5+\sqrt{7}} \cdot \frac{5-\sqrt{7}}{5-\sqrt{7}} = \frac{3(5-\sqrt{7})}{25-7} = \frac{3(5-\sqrt{7})}{18} = \frac{5-\sqrt{7}}{6} = \frac{5}{6} - \frac{\sqrt{7}}{6}$$

$$c) \frac{x^2+4x+4}{x-2} \cdot \frac{2-x}{3x+6} = \frac{(x+2)(x+2)}{-(2-x)} \cdot \frac{2-x}{3(x+2)} = -\frac{x+2}{3}$$

$$d) \frac{3}{x} - \frac{9}{x+1} = \frac{3(x+1)-9x}{x(x+1)} = \frac{3x+3-9x}{x(x+1)} = \frac{-6x+3}{x(x+1)}$$

3. Factor completely:

$$a) 2x^2 - 5x - 3 = (2x + 1)(x - 3)$$

$$b) 8x^3 - 18x = 2x(4x^2 - 9) = 2x(2x - 3)(2x + 3)$$

$$c) x^3 - x^2 - 4x + 4 = x^2(x - 1) - 4(x - 1) = (x - 1)(x + 2)(x - 2)$$

4. Solve for x:

$$a) |5x + 6| = 16$$

$$5x + 6 = 16, 5x + 6 = -16$$

$$x = 2, x = -\frac{22}{5}$$

$$b) 2x^2 + 8x = 5$$

$$2(x^2 + 4x + 4) = 13$$

$$(x + 2)^2 = \frac{13}{2}$$

$$x + 2 = \pm \sqrt{\frac{13}{2}}$$

$$x = -2 \pm \sqrt{\frac{13}{2}}$$

$$x = -2 \pm \frac{\sqrt{26}}{2}$$

Or use Quadratic Formula:

$$2x^2 + 8x - 5 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-8 \pm \sqrt{8^2 - 4(2)(-5)}}{2(2)} = \frac{-8 \pm \sqrt{104}}{4} = \frac{-8 \pm 2\sqrt{26}}{4} = -2 \pm \frac{\sqrt{26}}{2}$$

c)  $x^{\frac{2}{3}} = 16$

$$(x^{\frac{2}{3}})^{\frac{3}{2}} = 16^{\frac{3}{2}}$$

$$x = \pm 64$$

d)  $\frac{4-2x}{3} + \frac{1}{6} = 2x$

$$\left(\frac{4-2x}{3} + \frac{1}{6} = 2x\right) 6$$

$$8 - 4x + 1 = 12x$$

$$16x = 9$$

$$x = \frac{9}{16}$$

e)  $\frac{3}{x-1} + \frac{2}{x+1} = \frac{8}{x^2-1}$

$$\left[\frac{3}{x-1} + \frac{2}{x+1} = \frac{8}{x^2-1}\right](x+1)(x-1)$$

$$3(x+1) + 2(x-1) = 8$$

$$3x + 3 + 2x - 2 = 8$$

$$5x = 7$$

$$x = \frac{7}{5}$$

5. Solve and graph on a number line:

a)  $|3x - 1| > 2$

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

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

$$\begin{aligned} \text{b) } |2x - 9| &\leq 1 \\ -1 &\leq 2x - 9 \leq 1 \\ 8 &\leq 2x \leq 10 \\ 4 &\leq x \leq 5 \end{aligned}$$

6. Find the domain of each function:

$$\begin{aligned} \text{a) } y &= \sqrt{2x - 1} \\ 2x - 1 &\geq 0 \\ \left\{ x \mid x &\geq \frac{1}{2} \right\} \\ \left[ \frac{1}{2}, \infty \right) \end{aligned}$$

$$\begin{aligned} \text{b) } y &= \frac{3x-6}{2x+1} \\ \left\{ x \mid x &\neq -\frac{1}{2} \right\} \\ \left( -\infty, -\frac{1}{2} \right) \cup \left( -\frac{1}{2}, \infty \right) \end{aligned}$$

7. Find the intersection point of the lines  $3x - y = 5$  and  $2x + 3y = -4$ .

$$\begin{aligned} (3x - y = 5) \cdot 3 \\ 9x - 3y &= 15 \\ \underline{2x + 3y = -4} \\ 11x &= 11 \\ x &= 1 \end{aligned}$$

$$\begin{aligned} (3)(1) - y &= 5 \\ y &= -2 \end{aligned}$$

The intersection point is (1,-2)

8. Solve for x:  $4^{7x-1} = 4^{2x+4}$

$$\begin{aligned} 7x - 1 &= 2x + 4 \\ 5x &= 5 \\ x &= 1 \end{aligned}$$

9.

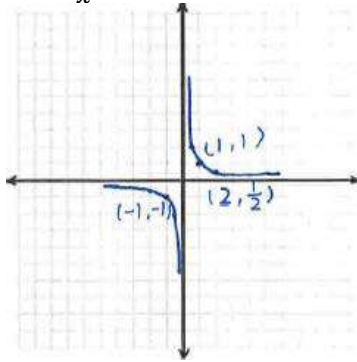
a) Write in log form:  $5^4 = 625$   
 $\log_5 625 = 4$

b) Write in exponential form:  $\log_3 81 = 4$   
 $3^4 = 81$

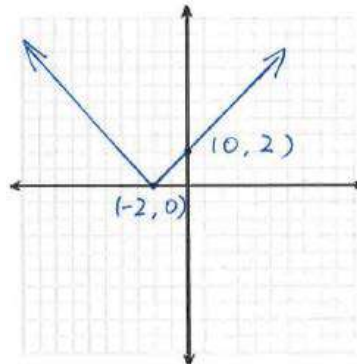
c) Evaluate:  $\log_2 32$   
 $\log_2 2^5 = 5$

10. Graph and label 3 points on each graph:

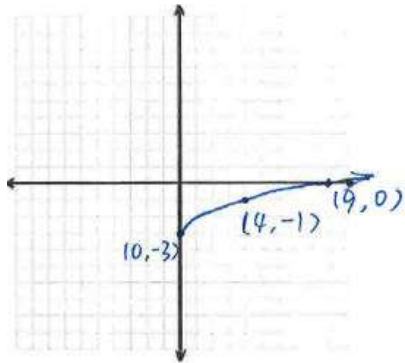
a)  $y = \frac{1}{x}$



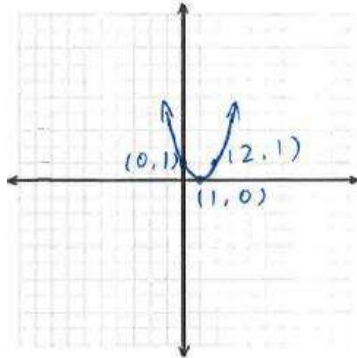
b)  $y = |x + 2|$



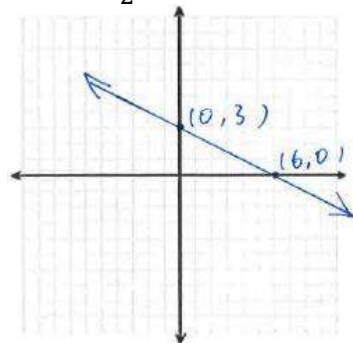
c)  $y = \sqrt{x} - 3$



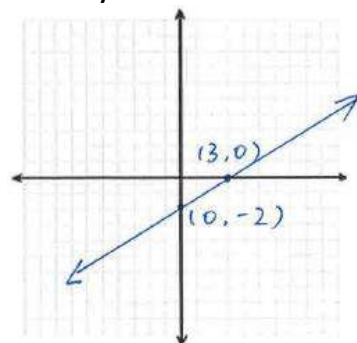
d)  $y = (x - 1)^2$



e)  $y = -\frac{1}{2}x + 3$



f)  $2x - 3y = 6$



11. a) Given:  $f(x) = x^2 + 2x - 5$  and  $g(x) = x + 1$ , find  $f(g(x))$ .

$$f(g(x)) = (x + 1)^2 + 2(x + 1) - 5 = x^2 + 2x + 1 + 2x + 2 - 5 = x^2 + 4x - 2$$

b) Given  $f(x) = \frac{3x-5}{x+1}$ , find  $f(x+2)$

$$f(x+2) = \frac{3(x+2) - 5}{(x+2) + 1} = \frac{3x+1}{x+3}$$

12. Given:  $f(x) = \frac{2x-1}{x+4}$

a) find the x-intercept(s)

Answer is  $(\frac{1}{2}, 0)$

b) find the y-intercept

Answer is  $(0, -\frac{1}{4})$

c) find any horizontal asymptotes

Answer is  $y=2$

d) find any vertical asymptotes

Answer is  $x=-4$