

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:

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

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

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

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

3. Factor completely:

$$\text{a) } 2x^2 - 5x - 3 = (2x + 1)(x - 3)$$

$$\text{b) } 8x^3 - 18x = 2x(4x^2 - 9) = 2x(2x - 3)(2x + 3)$$

$$\text{c) } x^3 - x^2 - 4x + 4 = x^2(x - 1) - 4(x - 1) = (x - 1)(x + 2)(x - 2)$$

4. Solve for x:

$$\text{a) } |5x + 6| = 16$$

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

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

$$\text{b) } 2x^2 + 8x = 5$$

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

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

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

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

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

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.

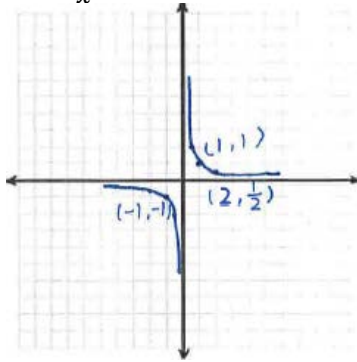
a) Write in log form: $5^4 = 625$
 $\log_5 625 = 4$

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

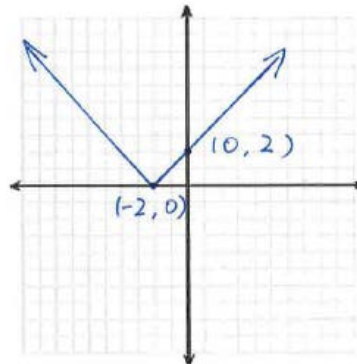
c) Evaluate: $\log_2 32$
 $\log_2 2^5 = 5$

10. Graph and label 3 points on each graph:

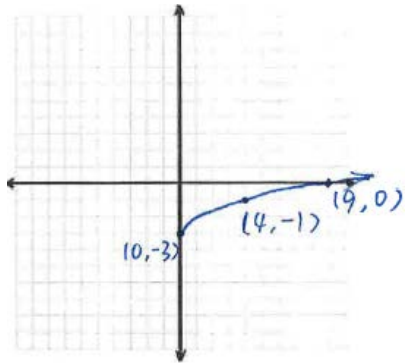
a) $y = \frac{1}{x}$



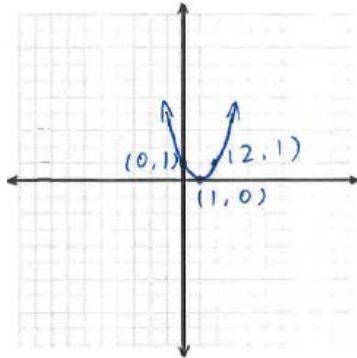
b) $y = |x + 2|$



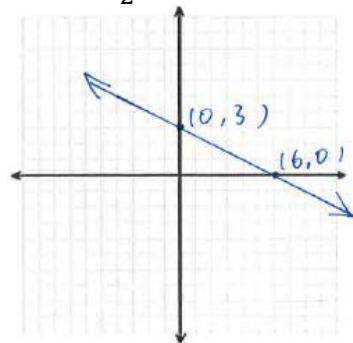
c) $y = \sqrt{x} - 3$



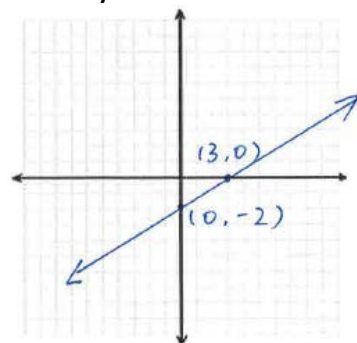
d) $y = (x - 1)^2$



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 $x=-4$