

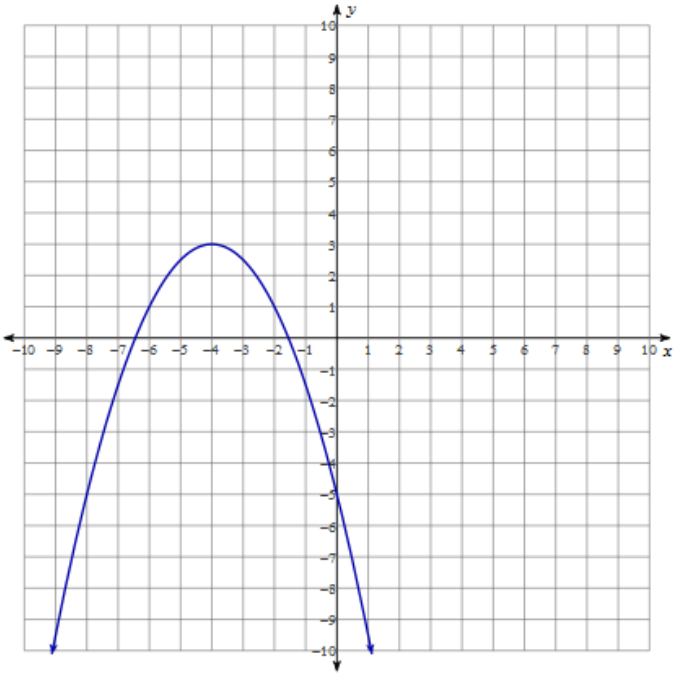
Function Toolkit #1

Use the Function Toolkit to sketch a graph of each of the following functions on the coordinate axes provided. Show all work, calculations, and tables where appropriate. State the domain, range, vertex, x- and y-intercepts when requested.

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

Mapping Rule: $(x, y) \rightarrow (x-4, -0.5y+3)$				
Base Function $y = x^2$		New Function		
-3	9	-7	-1.5	
-2	4	-6	1	
-1	1	-5	2.5	
0	0	-4	3	
1	1	-3	2.5	
2	4	-2	1	
3	9	-1	-1.5	

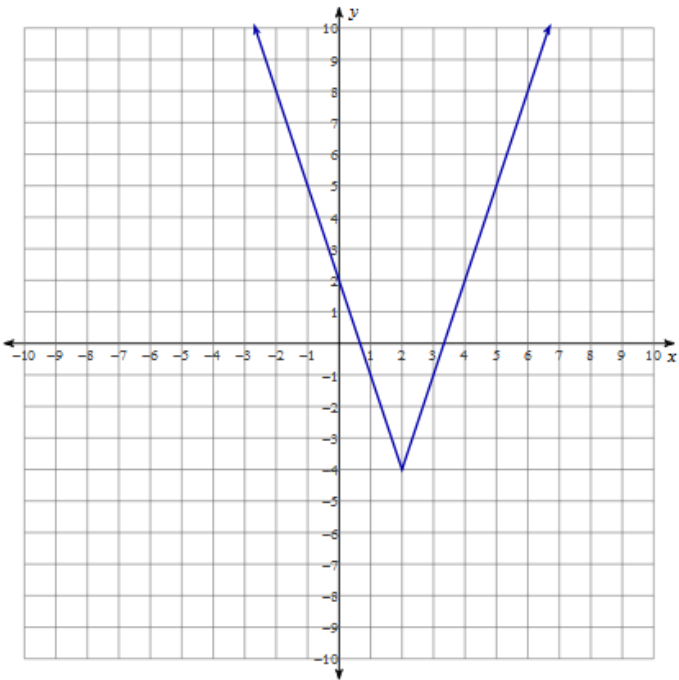
Vertex	x-int	y-int	Domain	Range
$(-4,3)$	$(-6.5,0)$ (-1.6)	$(0,-5)$	$\{x \in R\}$	$y \leq 3$



2. $y = 3|x - 2| - 4$

Mapping Rule: $(x, y) \rightarrow (x+2, 3y-4)$				
Base Function $y = x $		New Function		
-3	3	-1	5	
-2	2	0	2	
-1	1	1	-1	
0	0	2	-4	
1	1	3	-1	
2	2	4	2	
3	3	5	5	

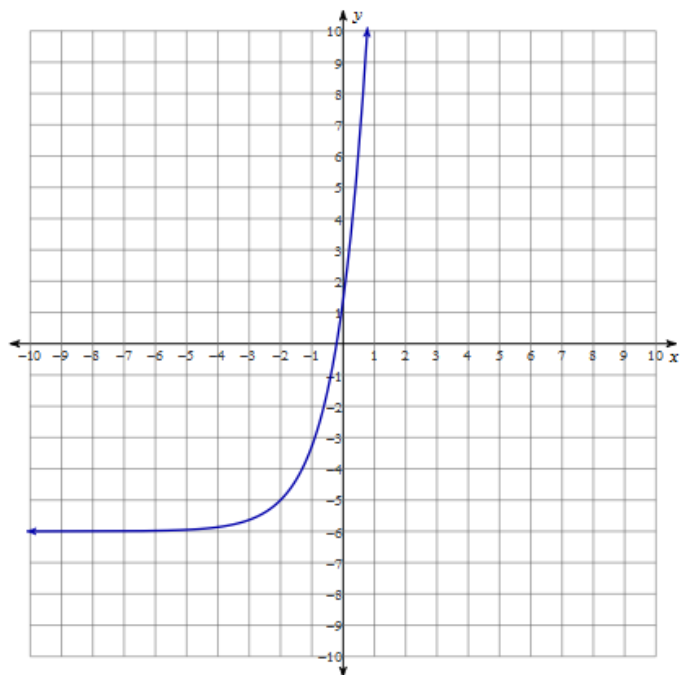
x-int	y-int	Domain	Range
$(2/3, 0)$ $(10/3, 0)$	$(0,2)$	$\{x \in R\}$	$y \geq -4$



3. $y = e^{x+2} - 6$

Mapping Rule: $(x, y) \rightarrow (x-2, y-6)$			
Base Function $y = e^x$		New Function	
-2	0.14	-4	-5.86
-1	0.37	-3	-5.63
0	1	-2	-5
1	2.72	-1	-3.28
2	7.39	0	1.39

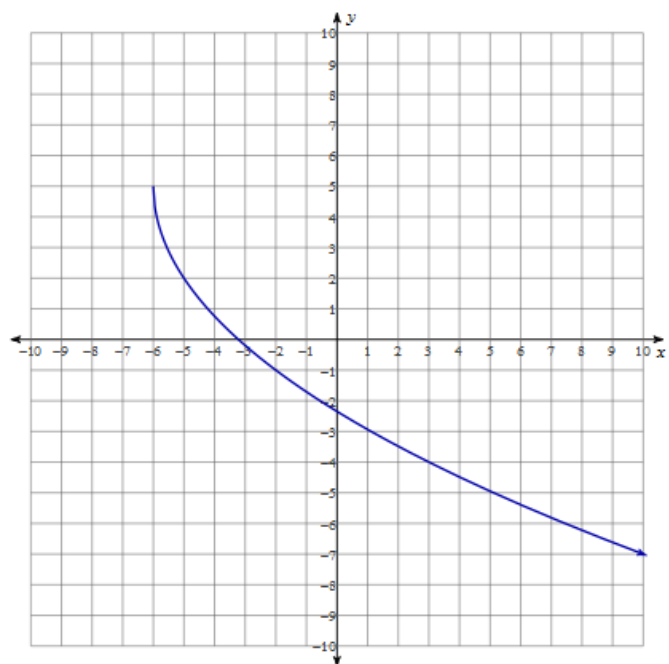
x-int	y-int	Domain	Range
$(-0.2, 0)$	$(0, 1.39)$	$\{x \in \mathbb{R}\}$	$y > -6$



4. $y = -3\sqrt{x+6} + 5$

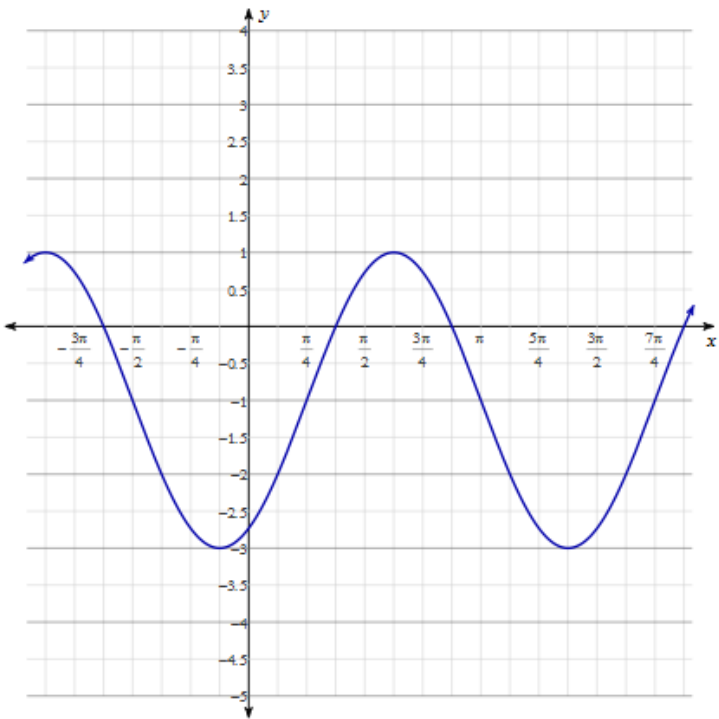
Mapping Rule: $(x, y) \rightarrow (x-6, -3y+5)$			
Base Function $y = \sqrt{x}$		New Function	
0	0	-6	5
1	1	-5	2
4	2	-2	-1
9	3	3	-4
16	4	10	-7

x-int	y-int	Domain	Range
$(-3.2, 0)$	$(0, -2.3)$	$\{x \geq -6\}$	$y \leq 5$



5. $y = 2\sin\left(\frac{4}{3}\left(x - \frac{\pi}{4}\right)\right) - 1$

Mapping Rule: $(x,y) \rightarrow (3/4x + \frac{\pi}{4}, 2y-1)$			
Base Function $y = \sin x$		New Function	
0	0	$\frac{\pi}{4} = \frac{2\pi}{8}$	-1
$\frac{\pi}{2}$	1	$\frac{5\pi}{8}$	1
π	0	π	-1
$\frac{3\pi}{2}$	-1	$\frac{11\pi}{8}$	-3
2π	0	$\frac{14\pi}{8} = \frac{7\pi}{4}$	-2



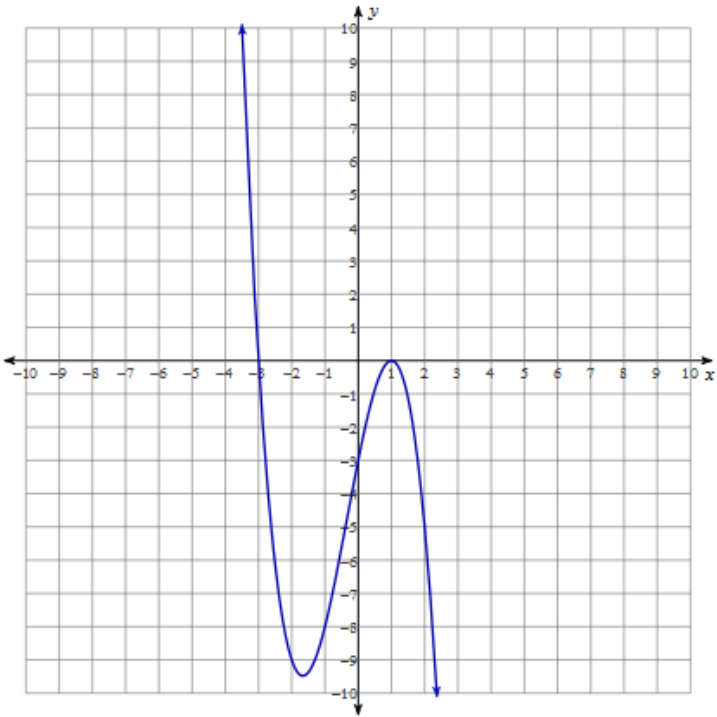
x-int	y-int	Domain	Range
$x = \frac{3\pi}{8} + \frac{3\pi n}{2}, n \in I$ $x = \frac{7\pi}{8} + \frac{3\pi n}{2}, n \in I$	(0,-2.73)	$\{x \in R\}$	$-3 \leq y \leq 1$

6. $y = -x^3 - x^2 + 5x - 3$

Factor to find all the x-intercepts.

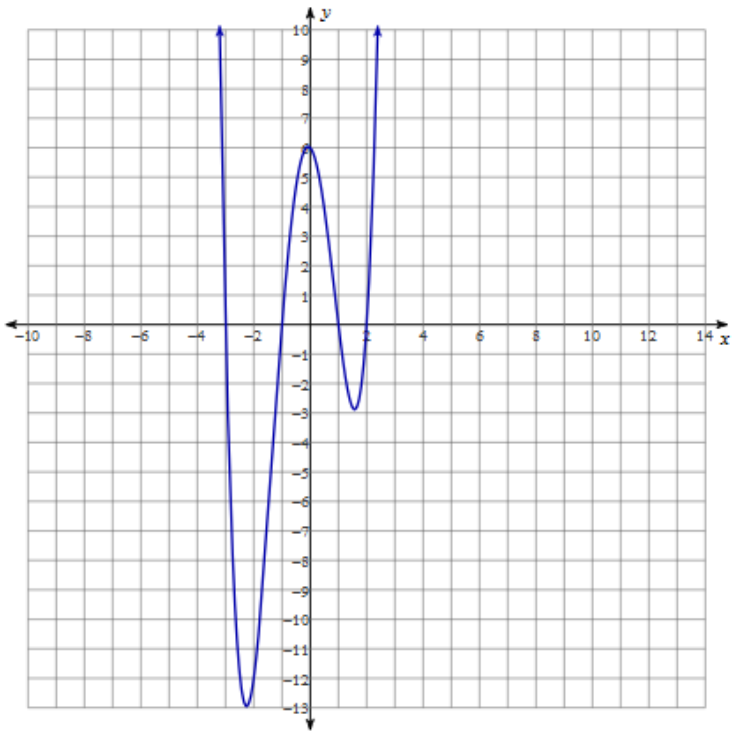
$y = -(x + 3)(x - 1)(x - 1)$

x-int	y-int	Domain	Range
(-3,0) (1,0)	(0,-3)	$\{x \in R\}$	$y \in R$
Other points: (-2,-9), (-1,-8), (2,-5)			



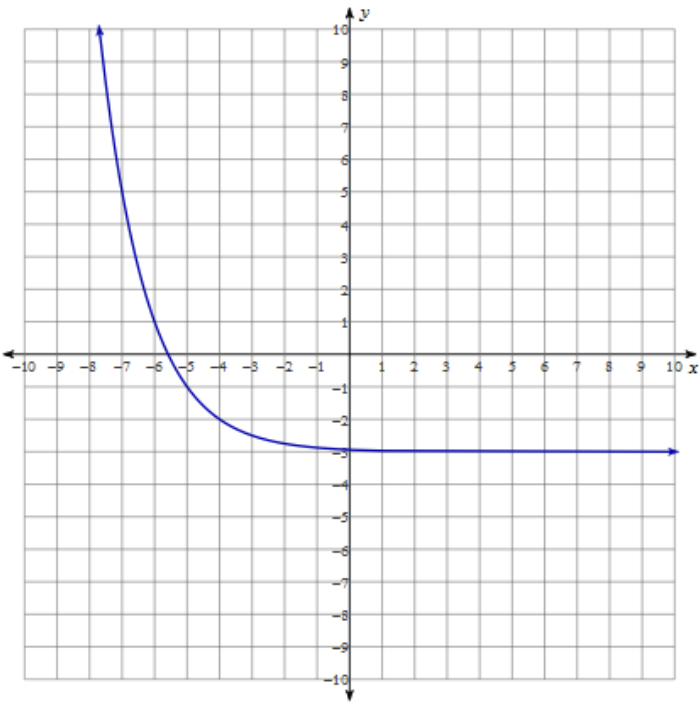
7. $y = (x + 3)(x - 2)(x^2 - 1)$

x-int	y-int	Domain	Range
(-3, 0) (-1, 0) (1, 0) (2, 0)	(0, 6)	$\{x \in \mathbb{R}\}$	-----
Other points: (-2, -12)			



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

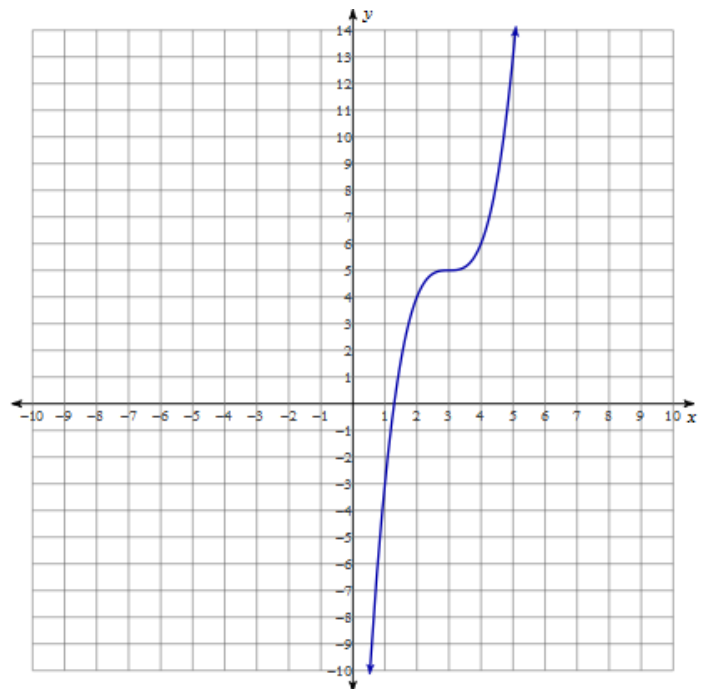
Mapping Rule: $(x, y) \rightarrow (x-4, y-3)$			
Base Function $y = \left(\frac{1}{2}\right)^x$		New Function	
-3	8	-7	5
-2	4	-6	1
-1	2	-5	-1
0	1	-4	-2
1	0.5	-3	-2.5
2	0.25	-2	-2.75



x-int	y-int	Domain	Range
(-5.58, 0)	(0, -2.94)	$\{x \in \mathbb{R}\}$	$y > -3$

9. $y = (x - 3)^3 + 5$

Mapping Rule: $(x, y) \rightarrow (x+3, y+5)$			
Base Function $y = x^3$		New Function	
-2	-8	1	-3
-1	-1	2	4
0	0	3	5
1	1	4	6
2	8	5	13



x-int	y-int	Domain	Range
(1.29, 0)	(0, -22)	$\{x \in \mathbb{R}\}$	$y \in \mathbb{R}$

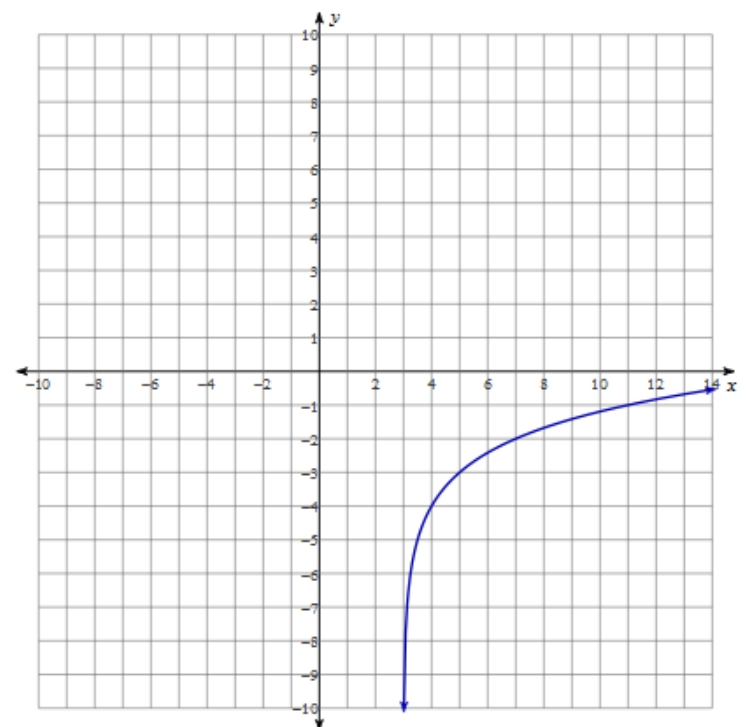
$$-5 = (x - 3)^3$$

$$(-5)^{\frac{1}{3}} = x - 3$$

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

10. $y = \log_2(x - 3) - 4$

Mapping Rule: $(x, y) \rightarrow (x+3, y-4)$			
Base Function $y = \log_2 x$ $2^y = x$		New Function	
0.25	-2	3.25	-6
0.5	-1	3.5	-5
1	0	4	-4
2	1	5	-3
4	2	7	-2
8	3	11	-1

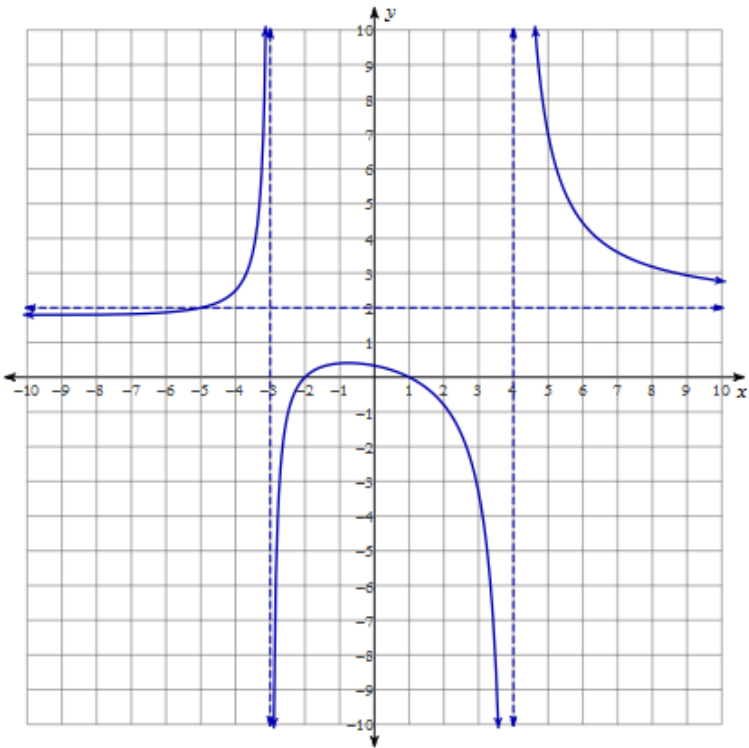


x-int	y-int	Domain	Range
(19, 0)	no y-int	$\{x > 3\}$	$y \in \mathbb{R}$

11. $y = \frac{2x^2 + 2x - 4}{x^2 - x - 12}$

Factored form: $\frac{2(x + 2)(x - 1)}{(x - 4)(x + 3)}$

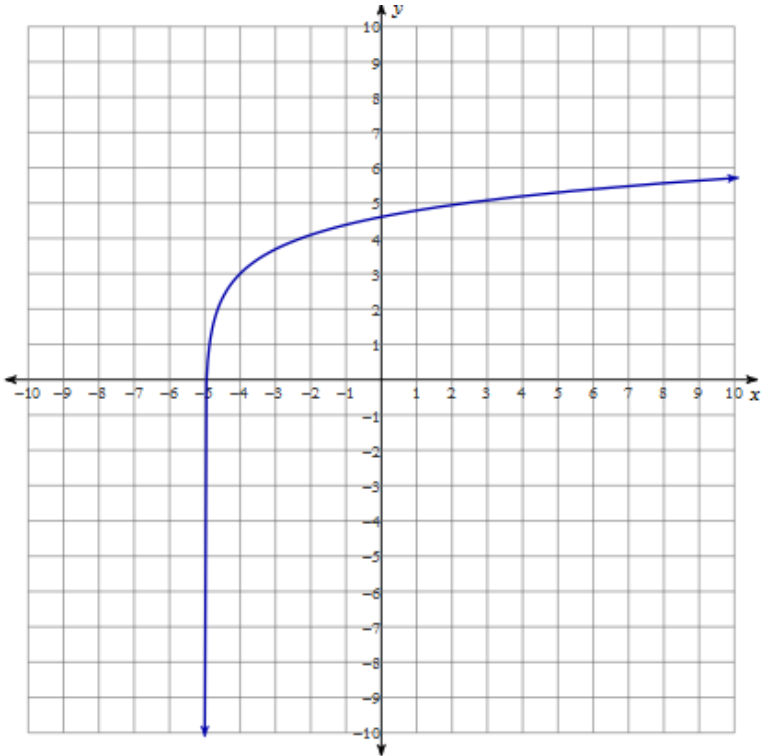
x-int	y-int	Domain	Range
(-2,0) (1,0)	(0,1/3)	$\{x \neq -3, 4\}$	-----
Other points: (-5, 2), (-4, 2.5), (-1, 0.4), (2, -0.8), (3, -3.3), (5, 7)			



12. $y = \ln(x + 5) + 3$

Mapping Rule: $(x, y) \rightarrow (x-5, y+3)$			
Base Function $y = \ln x$ $e^y = x$		New Function	
0.37	-1	-4.63	2
1	0	-4	3
2.72	1	-2.28	4
7.4	2	2.4	5

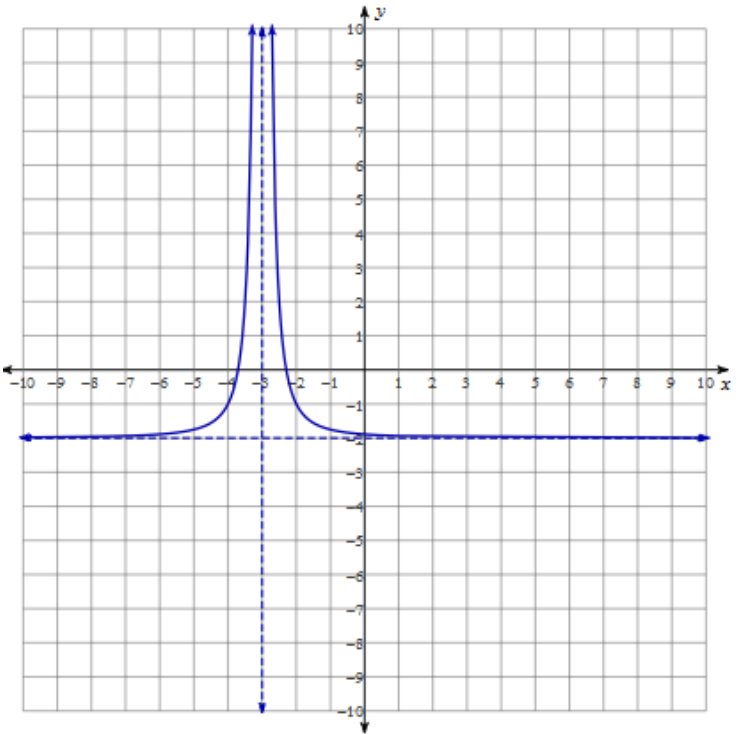
x-int	y-int	Domain	Range
(-4.9, 0)	(0, 4.6)	$\{x > -5\}$	$y \in R$



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

Mapping Rule: $(x, y) \rightarrow (x-3, y-2)$			
Base Function $y = \frac{1}{x^2}$		New Function	
-2	1/4	-5	-1.75
-1	1	-4	-1
0	-----	-3	-----
1	1	-2	-1
2	1/4	-1	-1.75

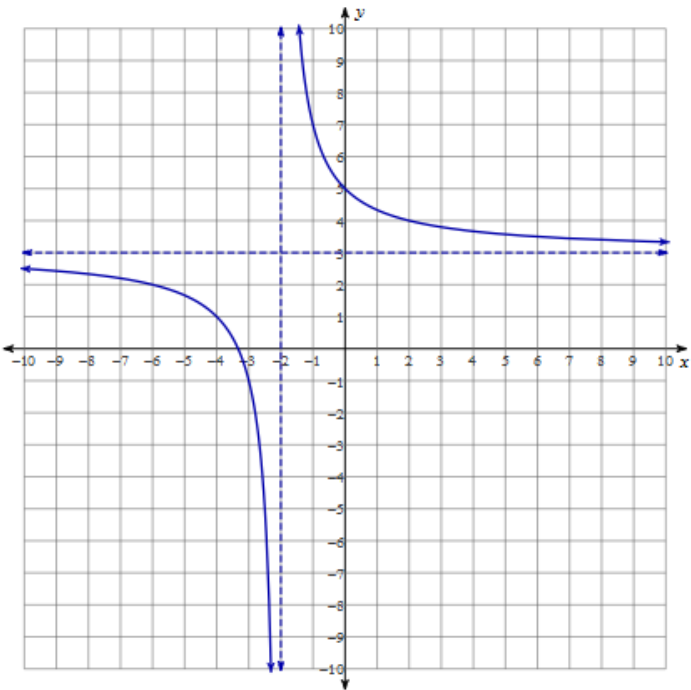
x-int	y-int	Domain	Range
(-2.3, 0) (-3.7, 0)	(0,-1.9)	$\{x \neq -3\}$	$y > -2$



14. $y = \frac{4}{x+2} + 3$

Mapping Rule: $(x, y) \rightarrow (x-2, 4y+3)$			
Base Function $y = \frac{1}{x}$		New Function	
-2	-1/2	-4	1
-1	-1	-3	-1
0	-----	-2	-----
1	1	-1	7
2	1/2	0	5

x-int	y-int	Domain	Range
(-10/3, 0)	(0, 5)	$\{x \neq -2\}$	$y \neq 3$



15. $y = -2\cos\left(\frac{1}{2}x\right) + 1$

Mapping Rule: $(x, y) \rightarrow (2x, -2y+1)$			
Base Function $y = \cos x$		New Function	
0	1	0	-1
$\frac{\pi}{2}$	0	π	1
π	-1	2π	3
$\frac{3\pi}{2}$	0	3π	1
2π	1	4π	-1

x-int	y-int	Domain	Range
$\frac{2\pi}{3} + 4\pi n, n \in I$	(0, -1)	$\{x \in R\}$	$-1 \leq y \leq 3$
$\frac{10\pi}{3} + 4\pi n, n \in I$			

16. $y = 3^{0.5x-1} + 1$

Mapping Rule: $(x, y) \rightarrow (2x+2, y+1)$			
Base Function $y = 3^x$		New Function $y = 3^{\frac{1}{2}(x-2)} + 1$	
-2	1/9	-2	10/9
-1	1/3	0	4/3
0	1	2	2
1	3	4	4
2	9	6	10

x-int	y-int	Domain	Range
no x-int	(0, 4/3)	$\{x \in R\}$	$y > 1$

