

## Assignment : Transformation of Functions

Date \_\_\_\_\_

Describe the transformations necessary to transform the graph of  $f(x)$  into that of  $g(x)$ .

1)  $f(x) = x^3$   
 $g(x) = -(3x)^3$

2)  $f(x) = x^3$   
 $g(x) = -(x - 1)^3$

3)  $f(x) = \sqrt{x}$   
 $g(x) = -2\sqrt{-x}$

4)  $f(x) = x^3$   
 $g(x) = \left(\frac{1}{2}x\right)^3 - 3$

Transform the given function  $f(x)$  as described and write the resulting function as an equation.

5)  $f(x) = x^3$   
expand horizontally by a factor of 3  
translate right 2 units

6)  $f(x) = x^2$   
reflect across the x-axis  
translate right 3 units

Find the transformations required to obtain the graph starting with a basic trig function.

7)  $y = 10\sin\left(2\theta - \frac{3\pi}{4}\right) + 1$

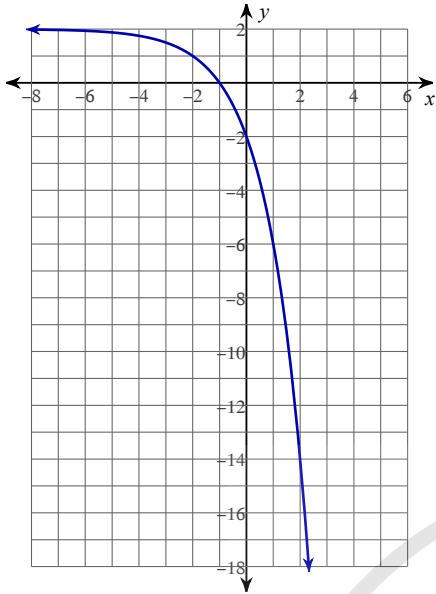
8)  $y = 8\cos\left(3\theta + \frac{\pi}{3}\right) + 3$

9)  $y = \sin 6\theta + 2$

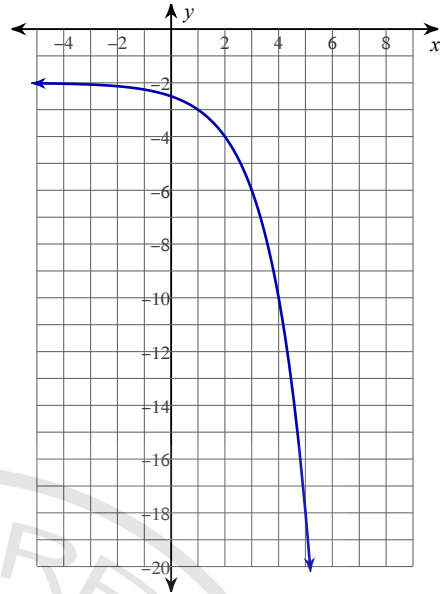
10)  $y = \frac{1}{4} \cdot \sin\left(8\theta + \frac{7\pi}{4}\right) - 2$

For each graph, determine the domain, range, intercepts, asymptotes, end behavior, and where the function is increasing or decreasing. Then write the corresponding equation.

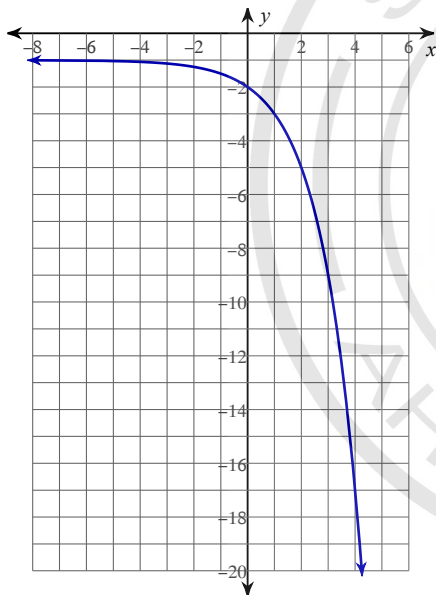
11)



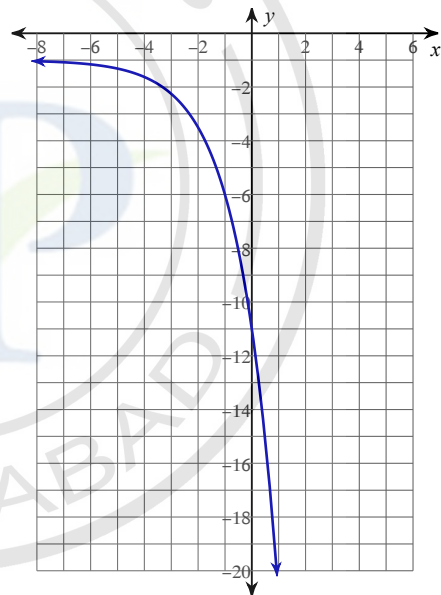
12)



13)



14)



Identify the domain and range of each.

15)  $y = \log_6(x - 1) - 3$

16)  $y = \log_3(x + 6) + 4$

17)  $y = \log_3(x - 1) - 5$

18)  $y = \log(x - 3) - 2$

## Answers to Assignment : Transformation of Functions

- 1) compress horizontally by a factor of 3  
reflect across the x-axis
- 2) reflect across the x-axis  
translate right 1 unit
- 3) reflect across the y-axis  
expand vertically by a factor of 2  
reflect across the x-axis
- 4) expand horizontally by a factor of 2  
translate down 3 units
- 5)  $g(x) = \left(\frac{1}{3}(x - 2)\right)^3$
- 6)  $g(x) = -(x - 3)^2$
- 7) Starting with  $\sin \theta$ ,  
vertically stretch by 10, horizontally  
shrink by  $\frac{1}{2}$ , translate  
right  $\frac{3\pi}{8}$ , translate up  
1
- 8) Starting with  $\cos \theta$ ,  
vertically stretch by 8,  
horizontally shrink by  
 $\frac{1}{3}$ , translate left  $\frac{\pi}{9}$ ,  
translate up 3
- 9) Starting with  $\sin \theta$ ,  
horizontally shrink by  
 $\frac{1}{6}$ , translate up 2
- 10) Starting with  $\sin \theta$ ,  
vertically shrink by  $\frac{1}{4}$ ,  
horizontally shrink by  
 $\frac{1}{8}$ , translate left  $\frac{7\pi}{32}$ ,  
translate down 2
- 11) Domain:  $(-\infty, \infty)$  Range:  $(-\infty, 2)$   
x-intercept: -1 y-intercept: -2  
Asymptote:  $y = 2$   
 $\lim_{x \rightarrow \infty} y = -\infty$   $\lim_{x \rightarrow -\infty} y = 2$   
Decreasing on:  $(-\infty, \infty)$   
 $y = -2 \cdot 2^{x+1} + 2$
- 12) Domain:  $(-\infty, \infty)$  Range:  $(-\infty, -2)$   
x-intercept: none y-intercept:  $-\frac{5}{2}$   
Asymptote:  $y = -2$   
 $\lim_{x \rightarrow \infty} y = -\infty$   $\lim_{x \rightarrow -\infty} y = -2$   
Decreasing on:  $(-\infty, \infty)$   
 $y = -2 \cdot 2^{x-2} - 2$
- 13) Domain:  $(-\infty, \infty)$  Range:  $(-\infty, -1)$   
x-intercept: none y-intercept: -2  
Asymptote:  $y = -1$   
 $\lim_{x \rightarrow \infty} y = -\infty$   $\lim_{x \rightarrow -\infty} y = -1$   
Decreasing on:  $(-\infty, \infty)$   
 $y = -\frac{1}{2} \cdot 2^{x+1} - 1$
- 14) Domain:  $(-\infty, \infty)$  Range:  $(-\infty, -1)$   
x-intercept: none y-intercept: -11  
Asymptote:  $y = -1$   
 $\lim_{x \rightarrow \infty} y = -\infty$   $\lim_{x \rightarrow -\infty} y = -1$   
Decreasing on:  $(-\infty, \infty)$   
 $y = -5 \cdot 2^{x+1} - 1$
- 15) Domain:  $x > 1$   
Range: All reals
- 16) Domain:  $x > -6$   
Range: All reals
- 17) Domain:  $x > 1$   
Range: All reals
- 18) Domain:  $x > 3$   
Range: All reals