

Classwork/HW TBT#1

Determine if each function is continuous at the given  $x$ -values. If not continuous, classify each discontinuity.

1)  $f(x) = \frac{x^2}{x-1}$ ; at  $x = 1$

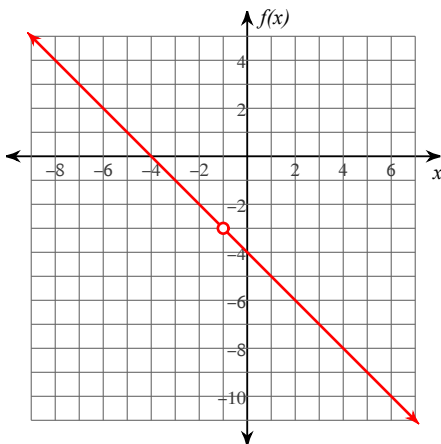
Infinite discontinuity at  $x = 1$

2)  $f(x) = \begin{cases} -x^2 + 6x - 6, & x \neq 1 \\ 3, & x = 1 \end{cases}$ ; at  $x = 1$

Removable discontinuity at  $x = 1$

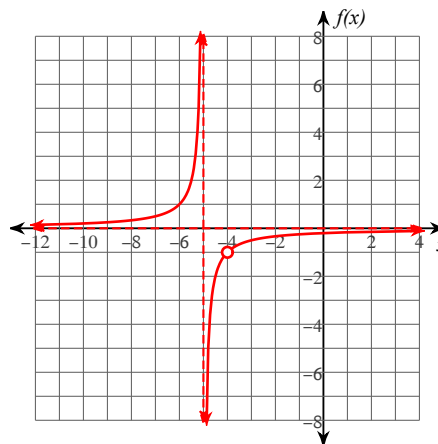
Determine if each function is continuous at the given  $x$ -values. If not continuous, classify each discontinuity. You may use the provided graph to sketch the function.

3)  $f(x) = -\frac{x^2 + 5x + 4}{x + 1}$ ; at  $x = -1$



Removable discontinuity at  $x = -1$

4)  $f(x) = -\frac{x + 4}{x^2 + 9x + 20}$ ; at  $x = -5$  and  $x = -4$



Removable discontinuity at  $x = -4$   
Infinite discontinuity at  $x = -5$

Consider each power function. Determine the domain and range, intercepts, end behavior, continuity, and regions of increase and decrease.

5)  $f(x) = 3x^2$

Domain:  $(-\infty, \infty)$

Range:  $[0, \infty)$

x-intercept: 0 y-intercept: 0

$\lim_{x \rightarrow -\infty} f(x) = \infty$   $\lim_{x \rightarrow \infty} f(x) = \infty$

Continuous on  $(-\infty, \infty)$

Increasing:  $(0, \infty)$

Decreasing:  $(-\infty, 0)$

6)  $f(x) = \frac{1}{2}x^4$

Domain:  $(-\infty, \infty)$

Range:  $[0, \infty)$

x-intercept: 0 y-intercept: 0

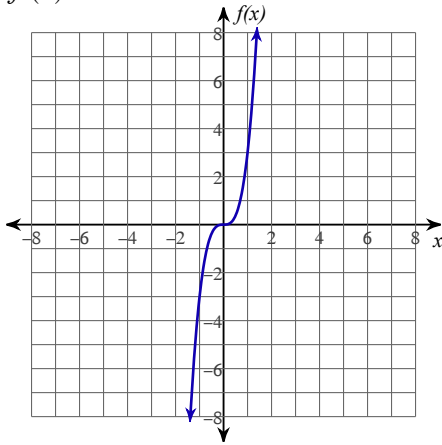
$\lim_{x \rightarrow -\infty} f(x) = \infty$   $\lim_{x \rightarrow \infty} f(x) = \infty$

Continuous on  $(-\infty, \infty)$

Increasing:  $(0, \infty)$

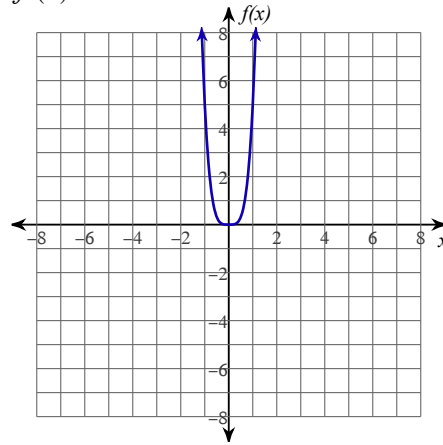
Decreasing:  $(-\infty, 0)$

7)  $f(x) = 3x^3$



Domain:  $(-\infty, \infty)$   
 Range:  $(-\infty, \infty)$   
 x-intercept: 0 y-intercept: 0  
 $\lim_{x \rightarrow -\infty} f(x) = -\infty$   $\lim_{x \rightarrow \infty} f(x) = \infty$   
 Continuous on  $(-\infty, \infty)$   
 Increasing:  $(-\infty, \infty)$

8)  $f(x) = 5x^4$



Domain:  $(-\infty, \infty)$   
 Range:  $[0, \infty)$   
 x-intercept: 0 y-intercept: 0  
 $\lim_{x \rightarrow -\infty} f(x) = \infty$   $\lim_{x \rightarrow \infty} f(x) = \infty$   
 Continuous on  $(-\infty, \infty)$   
 Increasing:  $(0, \infty)$   
 Decreasing:  $(-\infty, 0)$

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

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

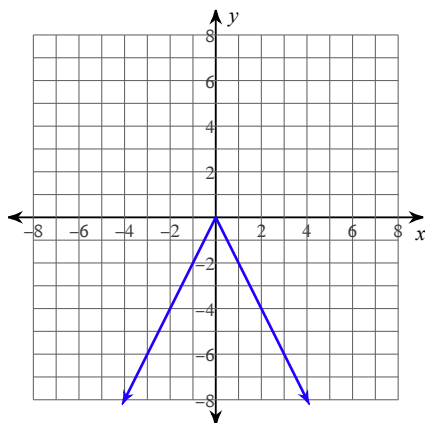
translate left 1 unit  
 translate down 2 units

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

reflect across the x-axis  
 translate right 1 unit

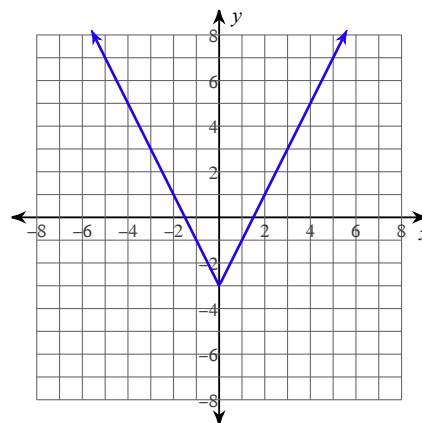
Identify the parent function  $f(x)$  and write an equation for the function given.

11)



Parent:  $f(x) = |x|$   
 $g(x) = -2|x|$

12)



Parent:  $f(x) = |x|$   
 $g(x) = 2|x| - 3$

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

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

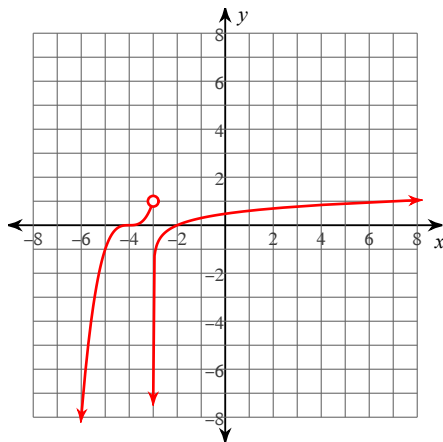
$$g(x) = -x^3 + 2$$

- 14)  $f(x) = \sqrt{x}$   
 reflect across the x-axis  
 translate left 1 unit  
 translate up 3 units

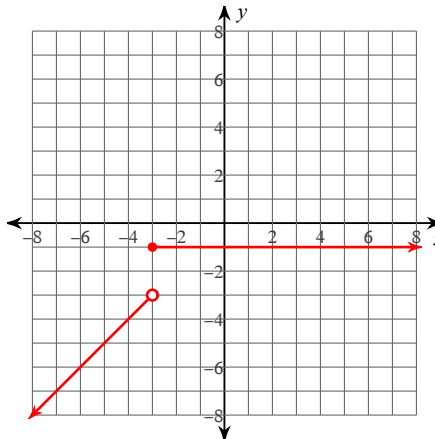
$$g(x) = -\sqrt{x+1} + 3$$

Sketch the graph of each function.

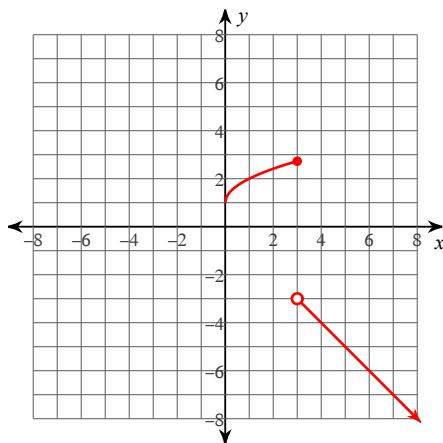
$$15) w(x) = \begin{cases} (x+4)^3, & x < -3 \\ \log(x+3), & x \geq -3 \end{cases}$$



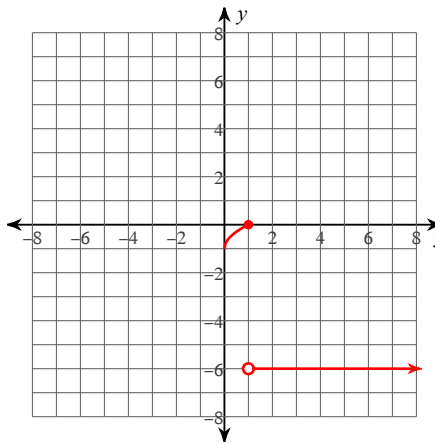
$$16) f(x) = \begin{cases} -|x|, & x < -3 \\ -1, & x \geq -3 \end{cases}$$



$$17) w(x) = \begin{cases} 1 + \sqrt{x}, & x \leq 3 \\ -|x|, & x > 3 \end{cases}$$



$$18) f(x) = \begin{cases} -1 + \sqrt{x}, & x \leq 1 \\ -6, & x > 1 \end{cases}$$



Perform the indicated operation.

- 19)  $f(n) = -3n$   
 $g(n) = n^2 - 2$   
 Find  $(f - g)(n)$   
 $-n^2 - 3n + 2$

- 20)  $g(n) = n^2 - 5n$   
 $f(n) = 3n - 1$   
 Find  $(g + f)(n)$   
 $n^2 - 2n - 1$

$$21) \begin{aligned} g(n) &= n^3 + 5n^2 \\ h(n) &= 3n + 3 \\ \text{Find } (g + h)(n) \\ n^3 + 5n^2 + 3n + 3 \end{aligned}$$

$$22) \begin{aligned} f(x) &= 4x - 4 && \frac{4x - 4}{4x - 1} \\ g(x) &= 4x - 1 \\ \text{Find } \left(\frac{f}{g}\right)(x) \end{aligned}$$

**Find the inverse of each function.**

$$23) \begin{aligned} g(x) &= -\frac{1}{6}x - \frac{1}{6} \\ g^{-1}(x) &= -6x - 1 \end{aligned}$$

$$24) \begin{aligned} f(x) &= \frac{-x - 4}{3} \\ f^{-1}(x) &= -3x - 4 \end{aligned}$$

$$25) \begin{aligned} h(x) &= -\frac{3}{5}x \\ h^{-1}(x) &= -\frac{5}{3}x \end{aligned}$$

$$26) \begin{aligned} g(x) &= \sqrt[3]{x + 1} + 1 \\ g^{-1}(x) &= -1 + (x - 1)^3 \end{aligned}$$

$$27) \begin{aligned} f(x) &= -2x^3 - 1 \\ f^{-1}(x) &= \sqrt[3]{\frac{-x - 1}{2}} \end{aligned}$$

$$28) \begin{aligned} g(x) &= \frac{3}{2}x + \frac{15}{2} \\ g^{-1}(x) &= -5 + \frac{2}{3}x \end{aligned}$$