أوراق عمل الدرس الثالث Continuity, end behavior and limits الأولى الوحدة من والنهايات الطرفي والسلوك الاتصال

تاريخ إضافة الملف على موقع المناهج: 2024-09-11 18:47:47

إعداد: اسلام الراشد

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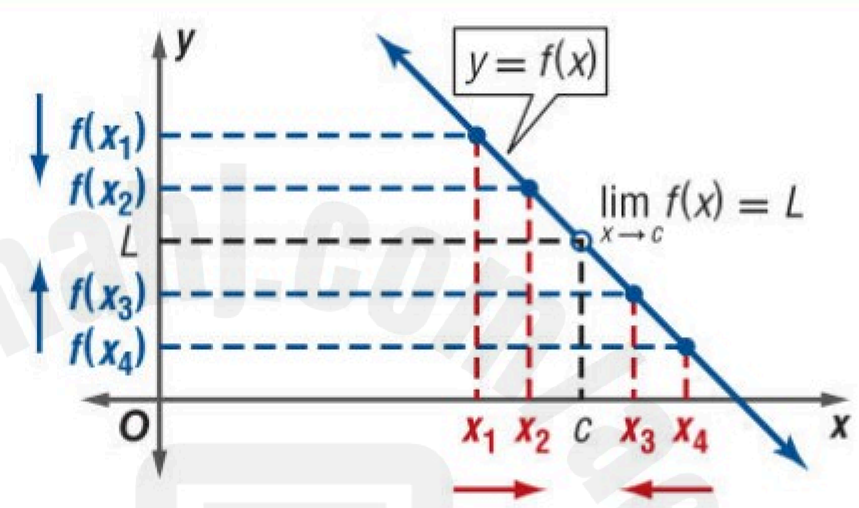
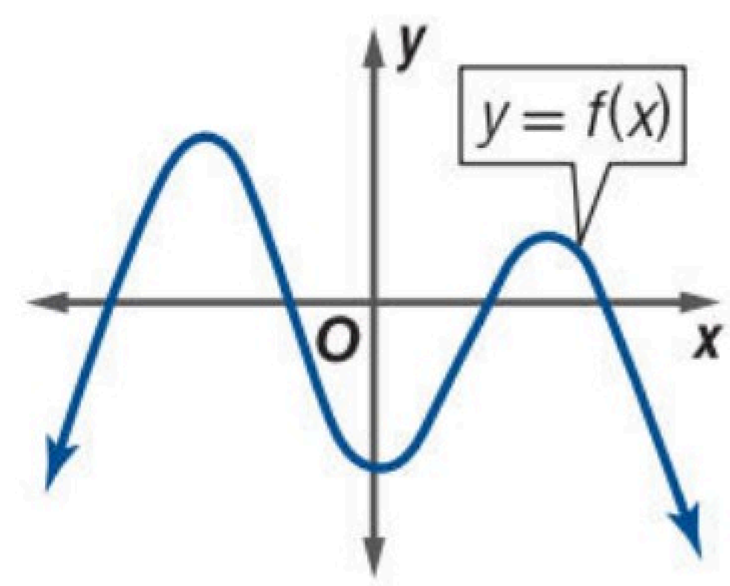
Continuity, End Behavior, and Limits

KeyConcept Limits

Words If the value of $f(x)$ approaches a unique value L as x approaches c from each side, then the limit of $f(x)$ as x approaches c is L.

Symbols $\lim_{x \to c} f(x) = L$, which is read *The limit of f(x) as x approaches c is L.*



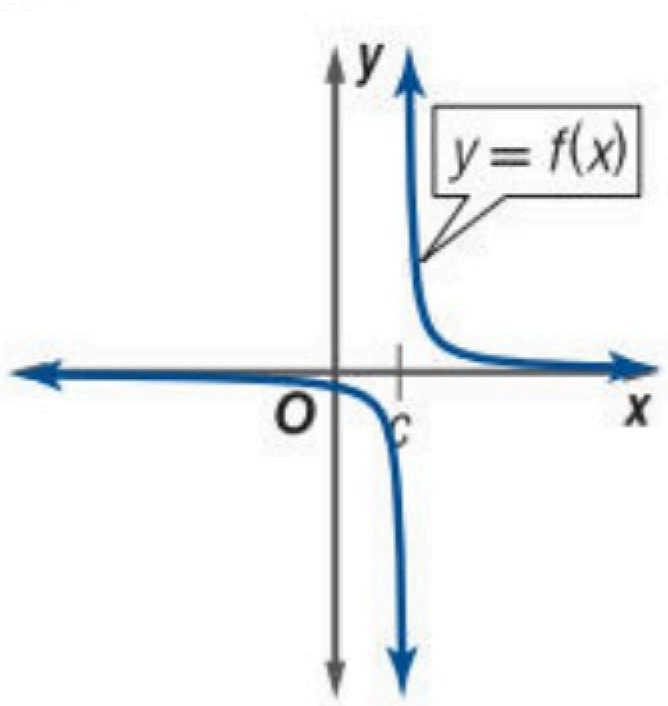


$f(x)$ is continuous for all x.

KeyConcept Types of Discontinuity

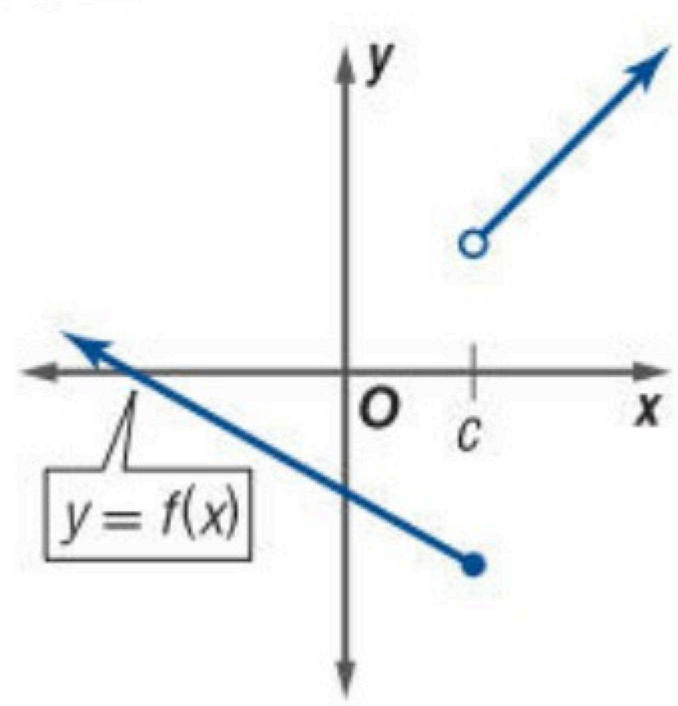
A function has an **infinite discontinuity** at $x = c$ if the function value increases or decreases indefinitely as x approaches c from the left and right.

Example



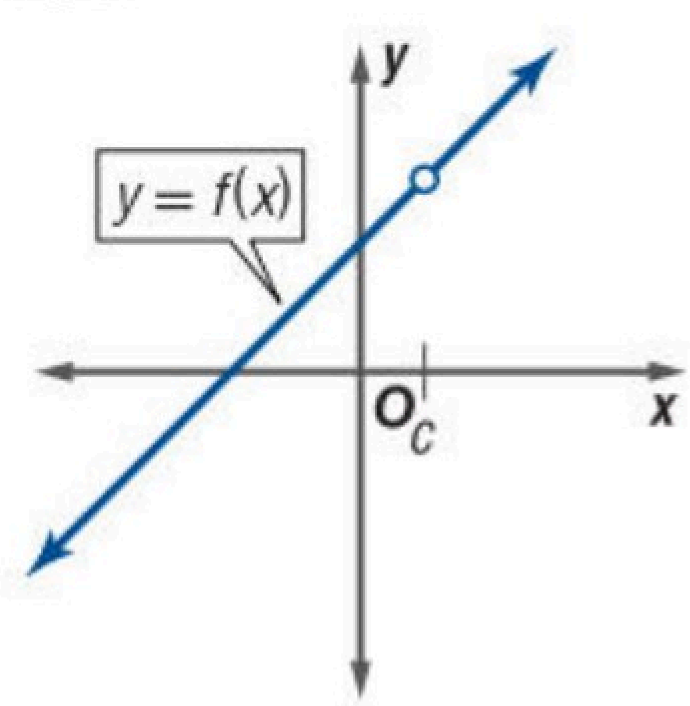
A function has a **jump discontinuity** at $x = c$ if the limits of the function as x approaches c from the left and right exist but have two distinct values.

Example



A function has a **removable discontinuity** if the function is continuous everywhere except for a hole at $x = c$.

Example



Identify a Point of Continuity

Determine whether $f(x) = 2x^2 - 3x - 1$ is continuous at $x = 2$. Justify using the continuity test.

x							
f(*x*)							

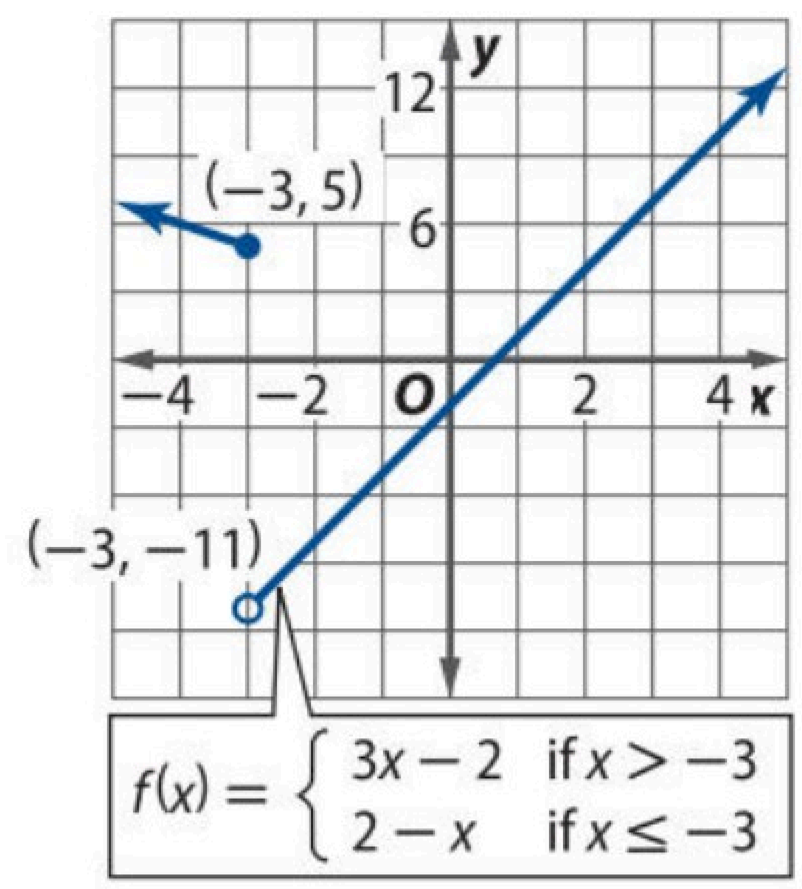
Determine whether each function is continuous at $x = 0$. Justify using the continuity test.

$$f(x) = \begin{cases} \frac{1}{x} & \text{if} \quad x < 0 \\ x & \text{if} \quad x \geq 0 \end{cases}$$

x							
f(*x*)							

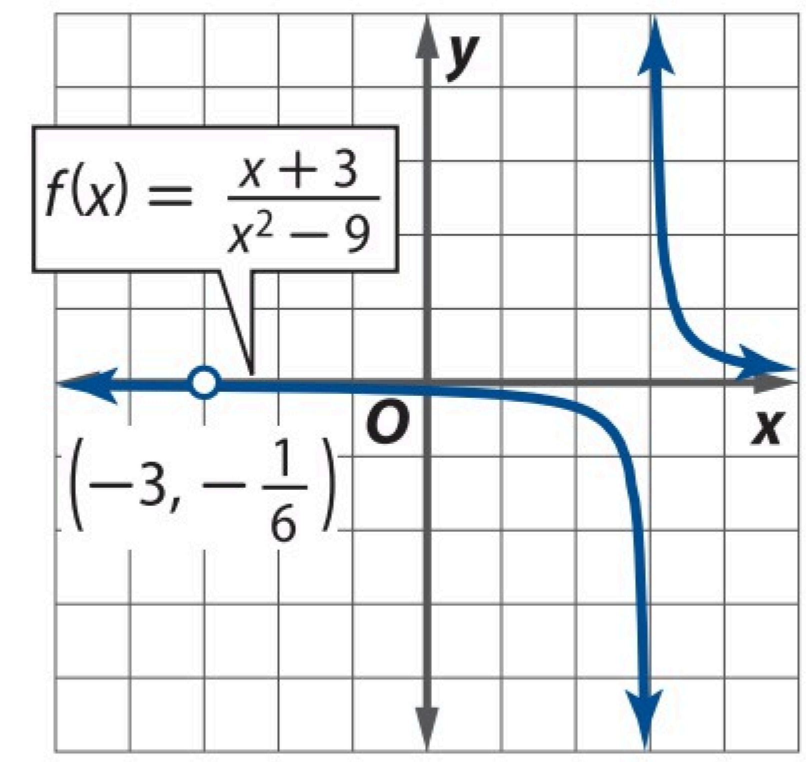
Determine whether each function is continuous at the given x-value(s). Justify using the continuity test. If discontinuous, identify the type of discontinuity as *infinite*, *jump*, or *removable*.

$$f(x)=\begin{cases}3x-2 & \text{if } x>-3\\ 2-x & \text{if } x\le -3\end{cases};\ \text{at } x=-3$$



x							
$f(x)$							

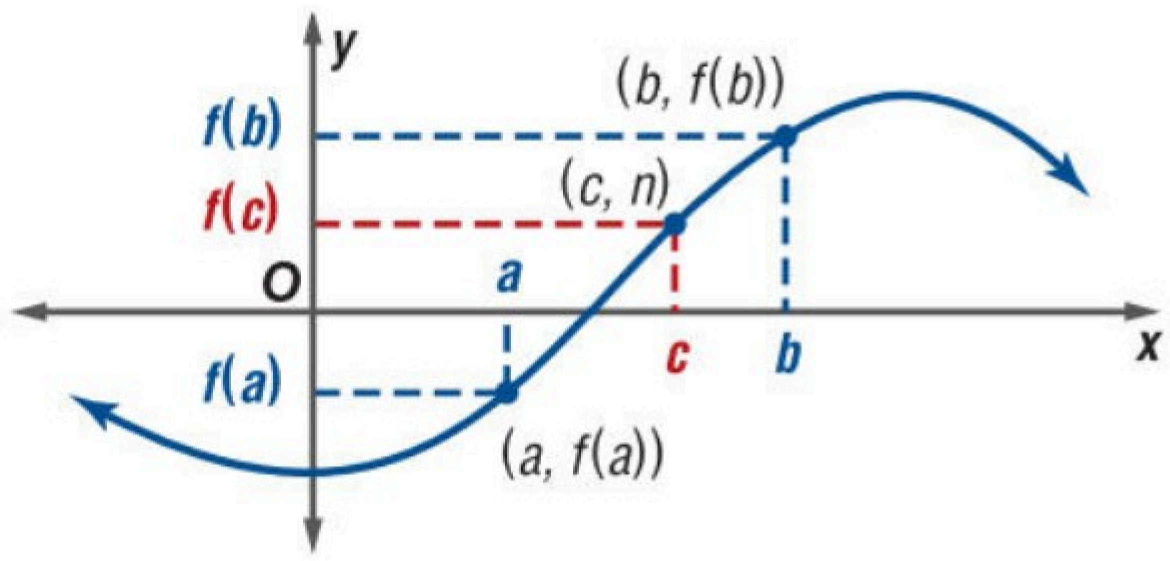
$$f(x)=\frac{x+3}{x^2-9};\ \text{at } x=-3$$



x							
$f(x)$							

KeyConcept Intermediate Value Theorem

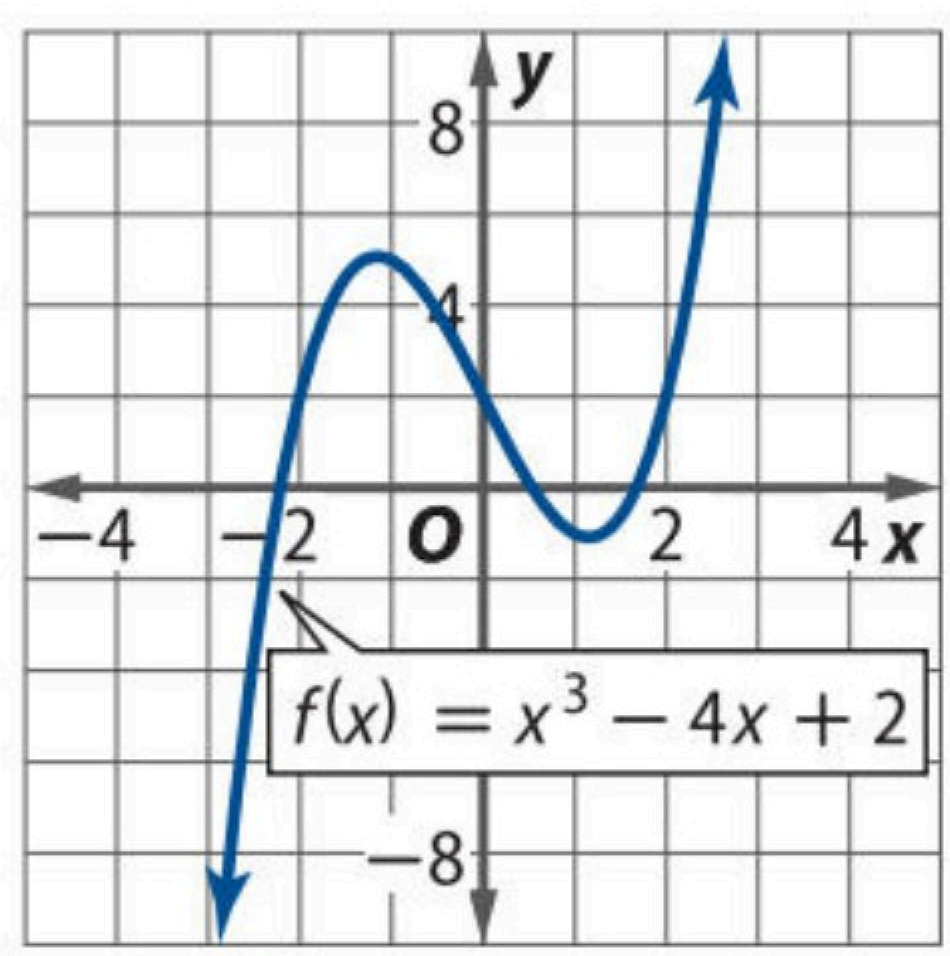
If $f(x)$ is a continuous function and $a < b$ and there is a value n such that n is between $f(a)$ and $f(b)$, then there is a number c, such that $a < c < b$ and $f(c) = n$.



Corollary: The Location Principle If $f(x)$ is a continuous function and $f(a)$ and $f(b)$ have opposite signs, then there exists at least one value c, such that $a < c < b$ and $f(c) = 0$. That is, there is a zero between a and b.

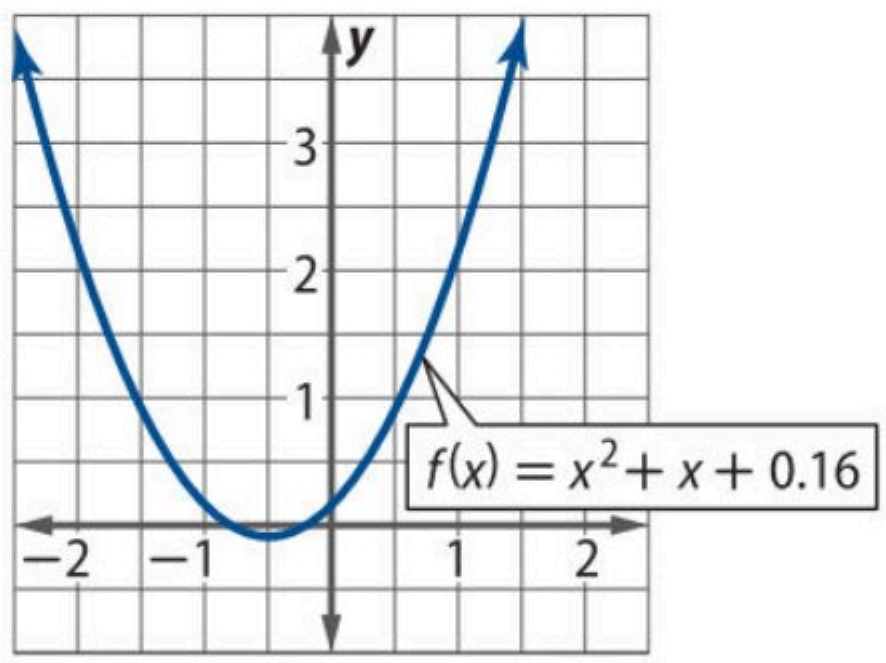
Determine between which consecutive integers the real zeros of each function are located on the given interval.

$f(x) = x^3 - 4x + 2$; $[-4, 4]$



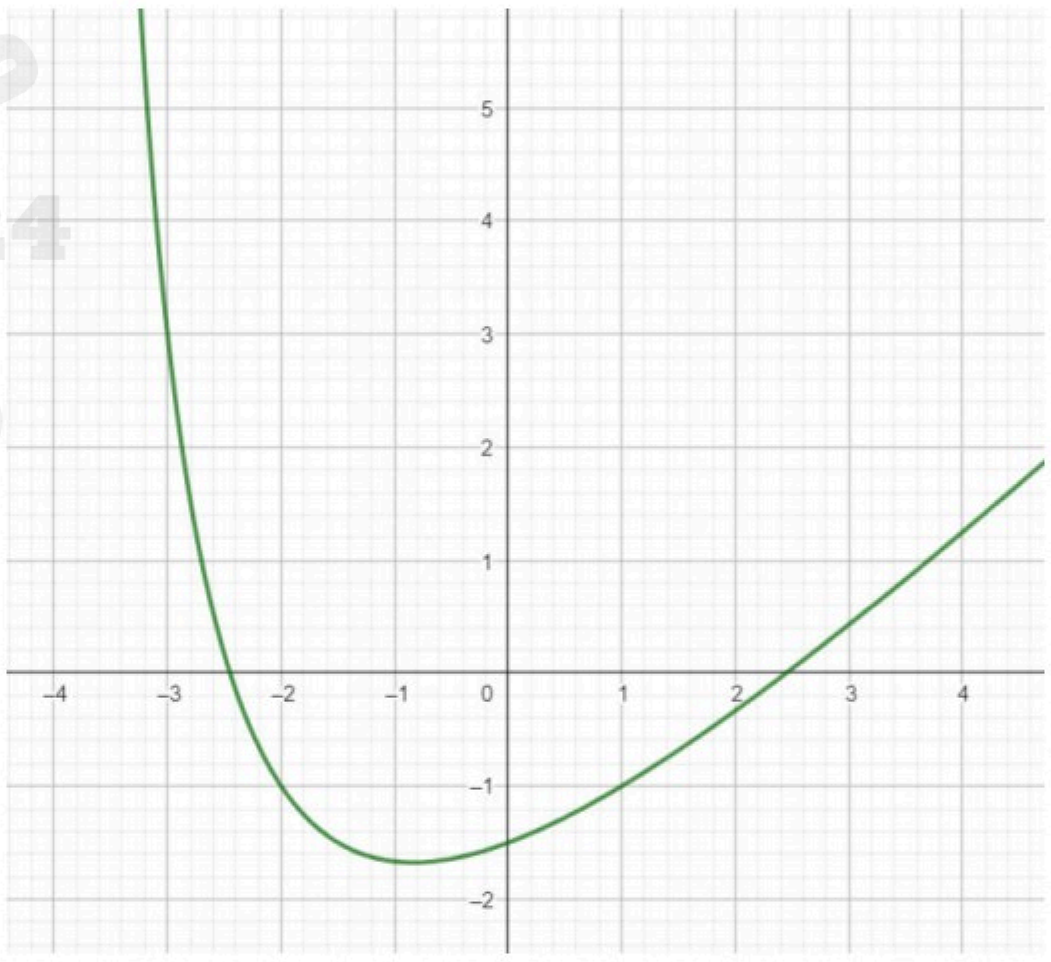
x							
$f(x)$							

$f(x) = x^2 + x + 0.16; [-3, 3]$



x							
$f(x)$							

$f(x) = \dfrac{x^2 - 6}{x + 4}; [-3, 4]$

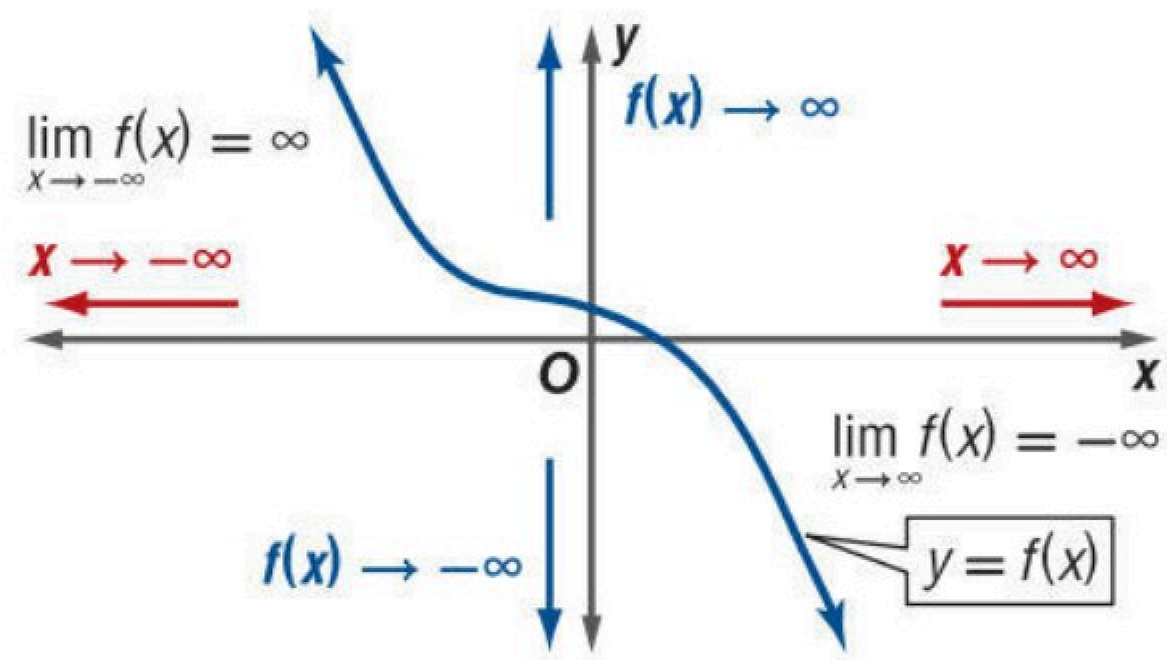


x							
$f(x)$							

2 End Behavior The **end behavior** of a function describes how a function *behaves* at either *end* of the graph. That is, end behavior is what happens to the value of $f(x)$ as x increases or decreases without bound—becoming greater and greater or more and more negative. To describe the end behavior of a graph, you can use the concept of a limit.

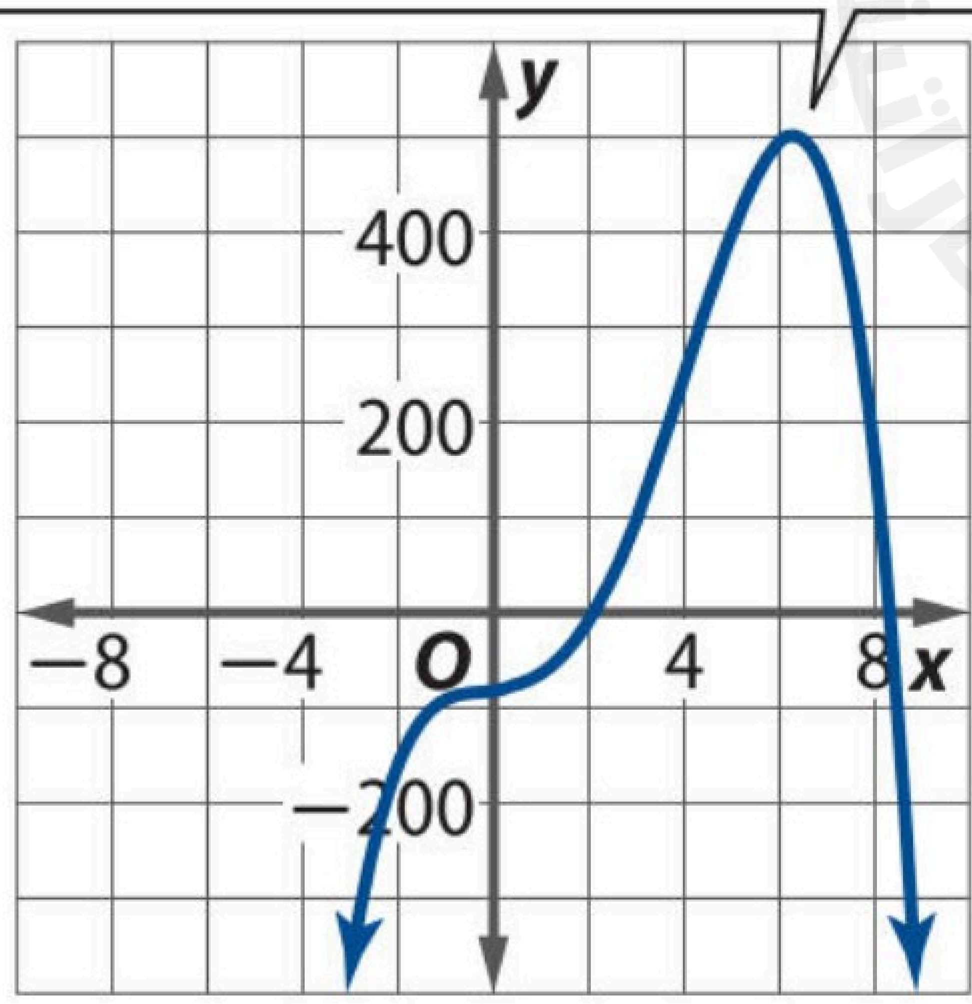
Left-End Behavior	**Right-End Behavior**
$\lim\limits_{x \to -\infty} f(x)$	$\lim\limits_{x \to \infty} f(x)$

One possibility for the end behavior of the graph of a function is for the value of $f(x)$ to increase or decrease without bound. This end behavior is described by saying that $f(x)$ approaches positive or negative infinity.

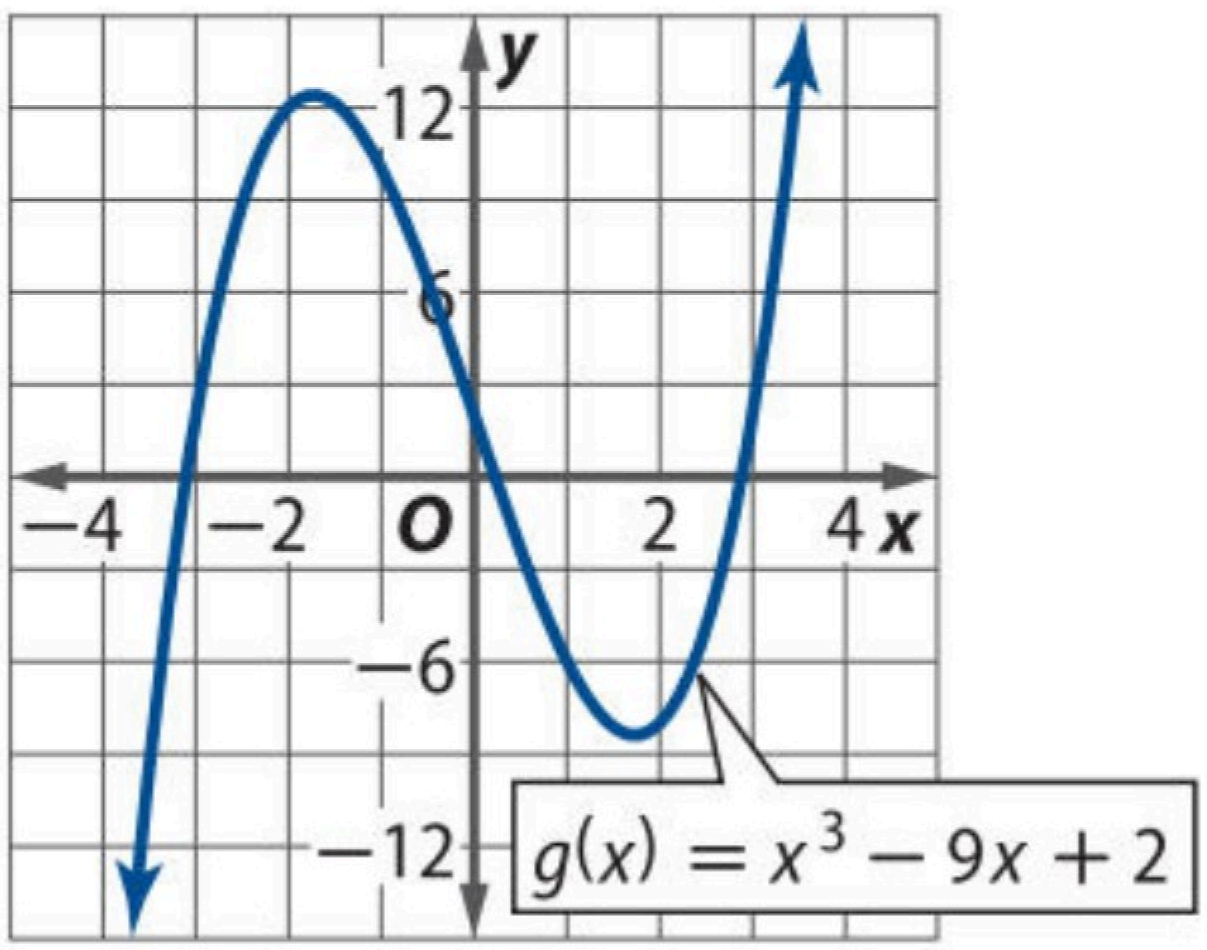


Use the graph of each function to describe its end behavior. Support the conjecture numerically.

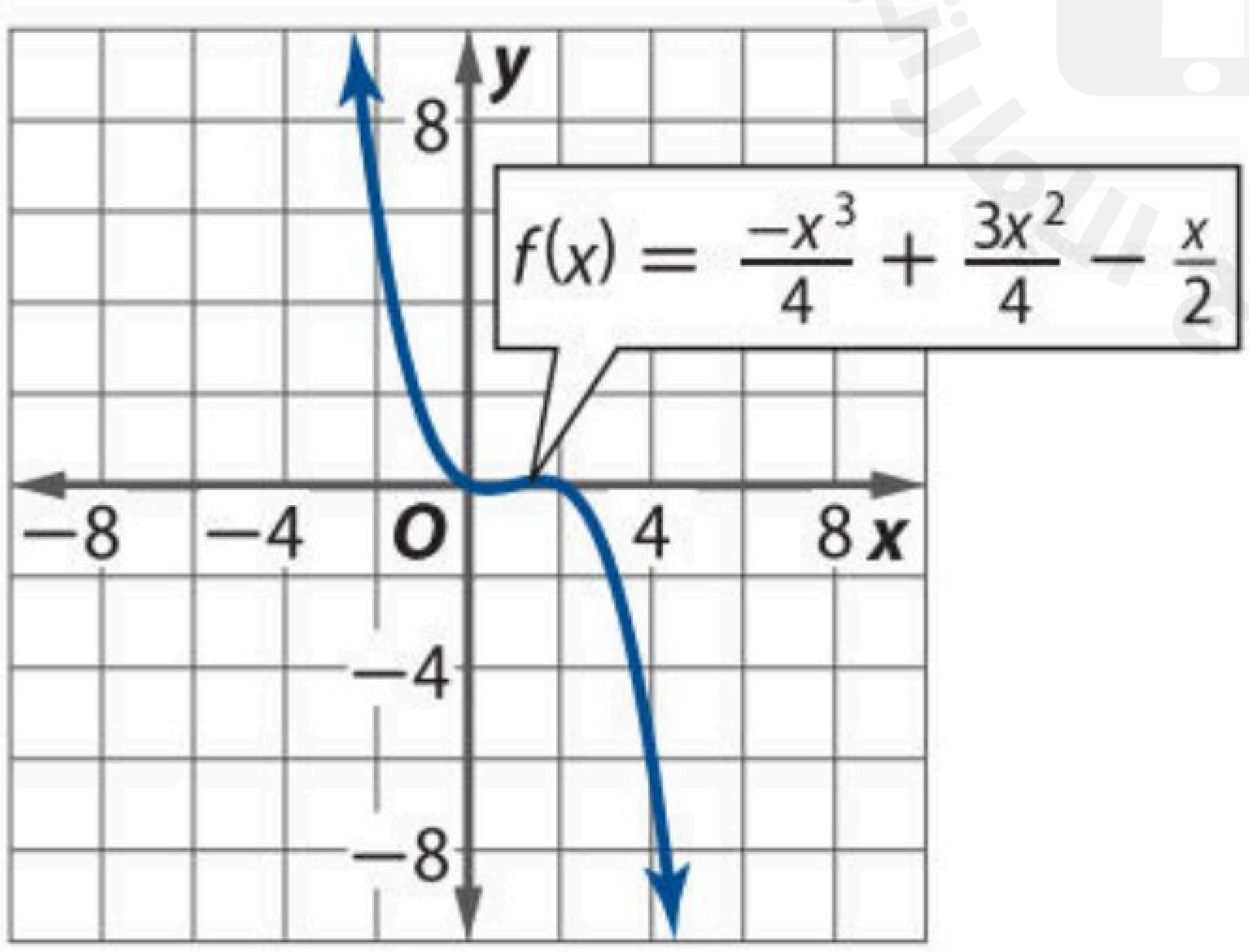
$f(x) = -x^4 + 8x^3 + 3x^2 + 6x - 80$



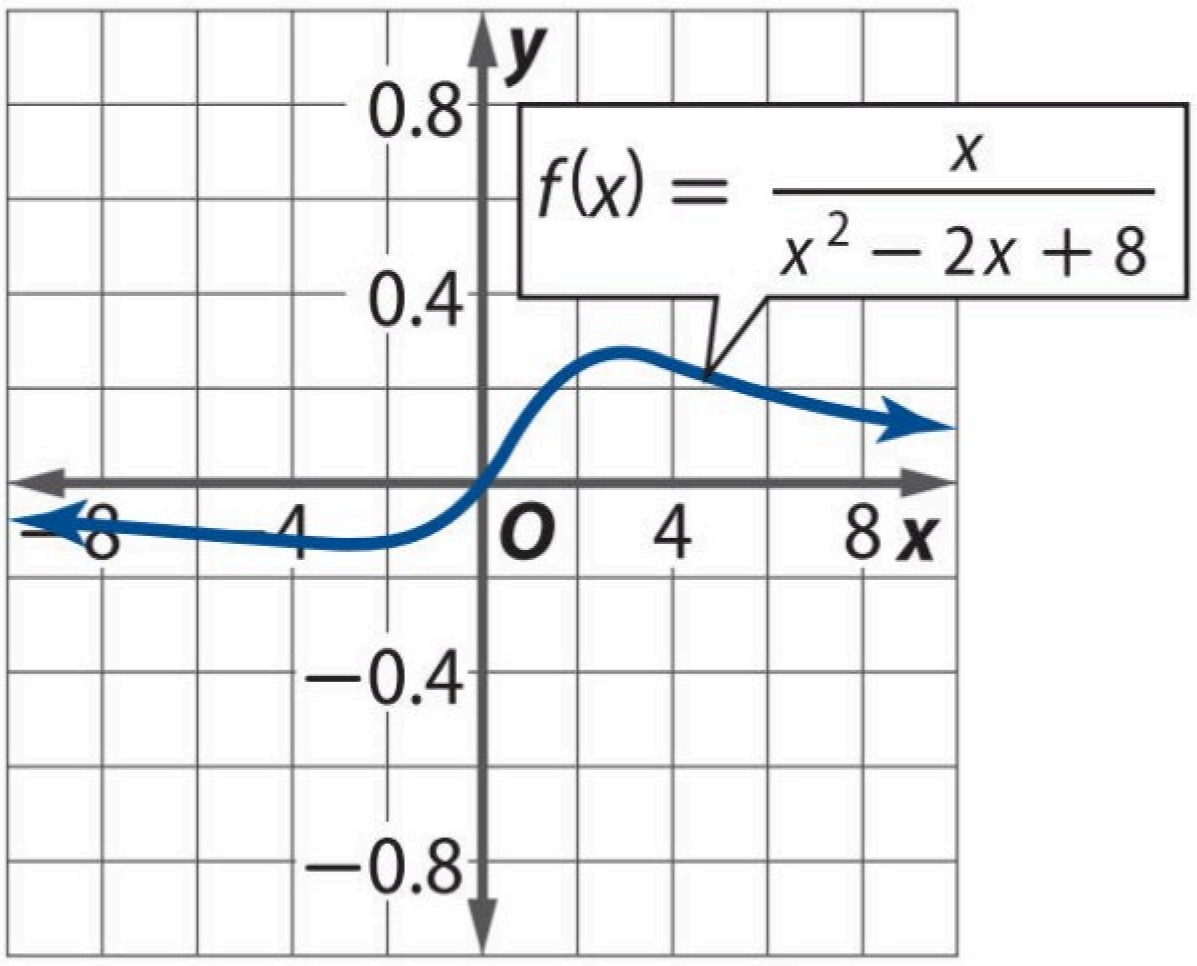
x							
f(x)							


y
12
6
−4
−2
O
2
4 x
−6
−12
$g(x) = x^3 - 9x + 2$

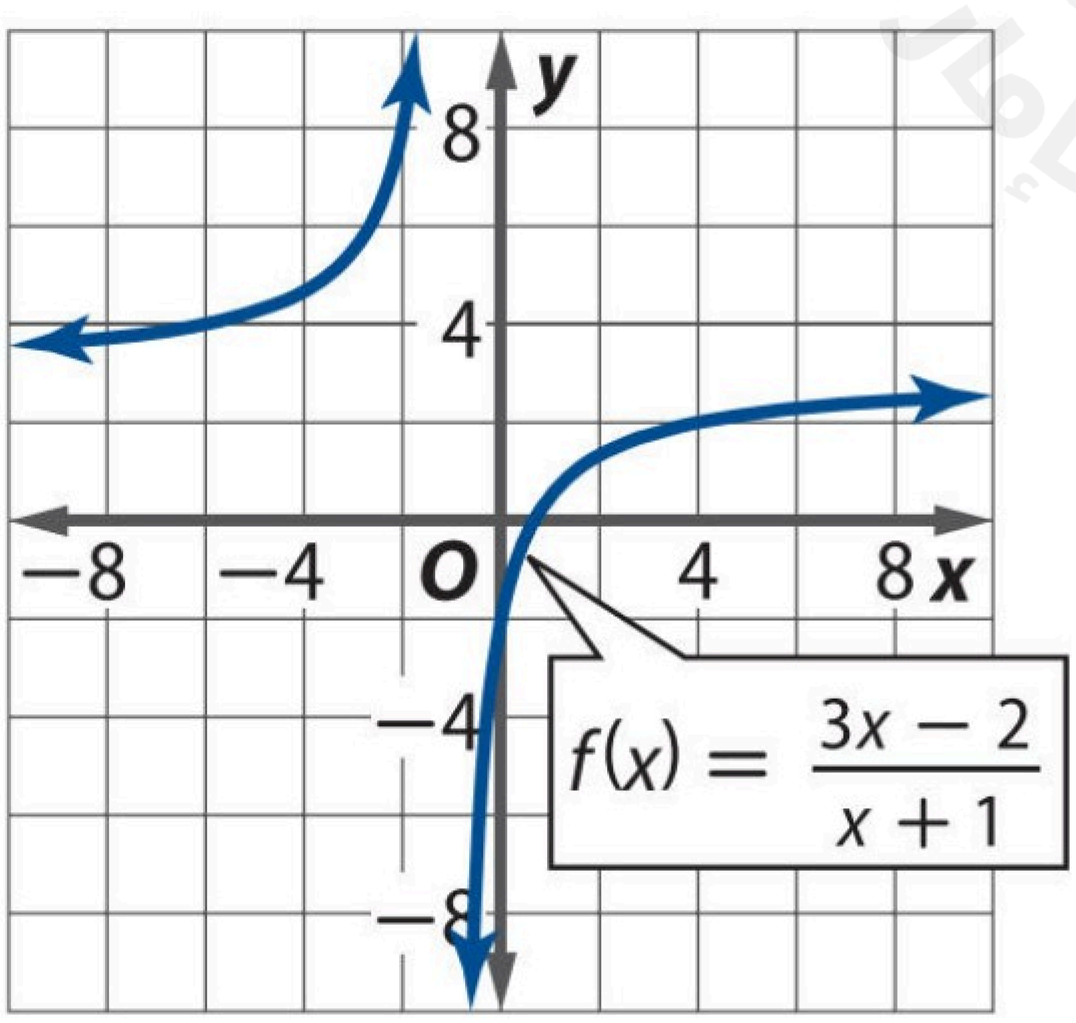
x							
$f(x)$							


y
8
$f(x) = \frac{-x^3}{4} + \frac{3x^2}{4} - \frac{x}{2}$
−8
−4
O
4
8 x
−4
−8

x							
$f(x)$							



x							
f(x)							



x							
f(x)							