WebAssign
2.5 Continuidad y Asíntotas (Homework)

David Corzo
Diferencial, section B, Spring 2019
Instructor: Christiaan Ketelaar

Current Score : 42 / 34 **Due :** Saturday, February 23, 2019 11:59 PM CST**Last Saved : n/a Saving... ()**

The due date for this assignment is past. Your work can be viewed below, but no changes can be made.

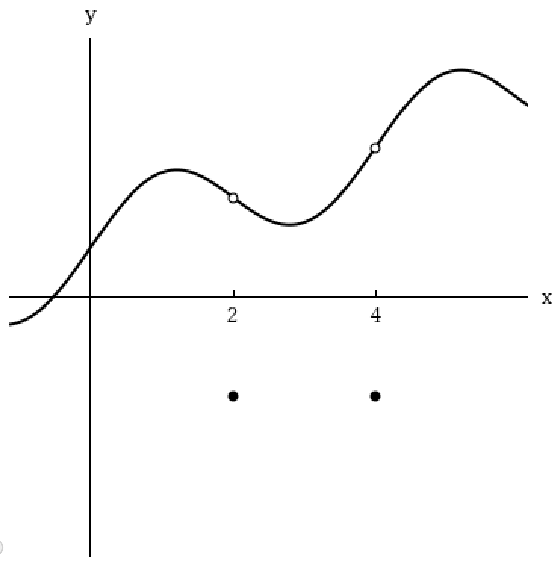
Important! Before you view the answer key, decide whether or not you plan to request an extension. Your Instructor may *not* grant you an extension if you have viewed the answer key. Automatic extensions are not granted if you have viewed the answer key.

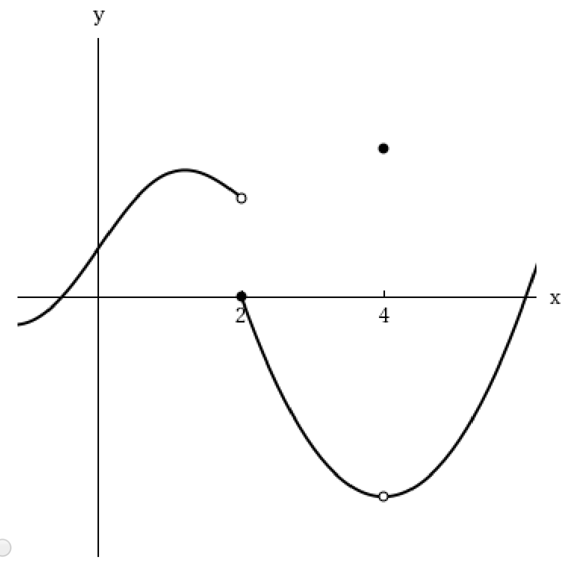
Request Extension

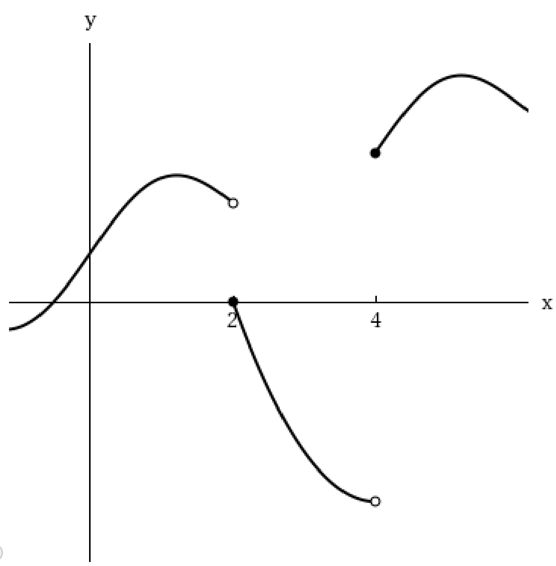
1. 1/1 points | Previous AnswersSCalcET8 2.5.007.

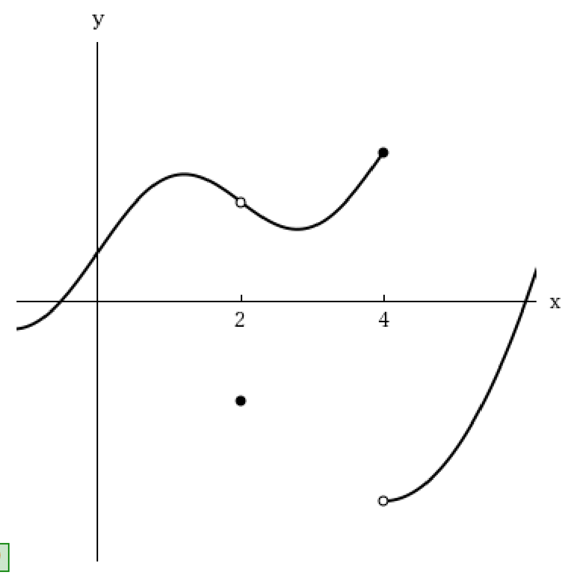
Sketch the graph of a function *f* that is continuous except for the stated discontinuity.

Removable discontinuity at 2, jump discontinuity at 4



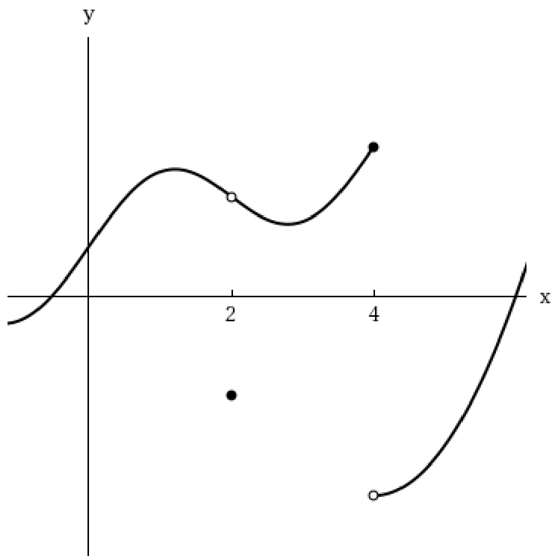






Solution or Explanation

The graph of $y = f(x)$ must have a removable discontinuity (a hole) at $x = 2$ and a jump discontinuity at $x = 4$.



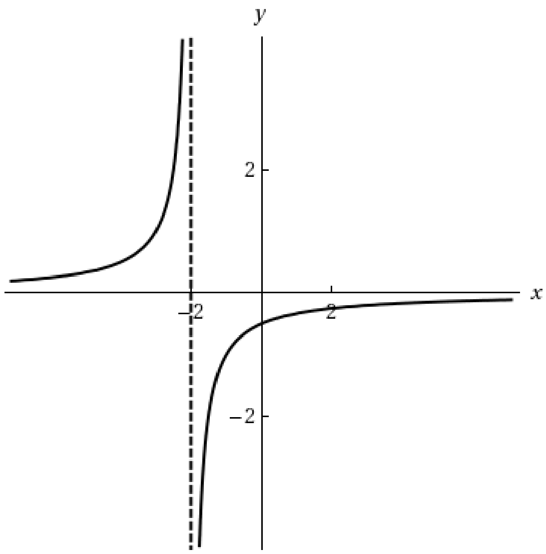
2. 2/2 points | Previous Answers SCalcET8 2.5.017.

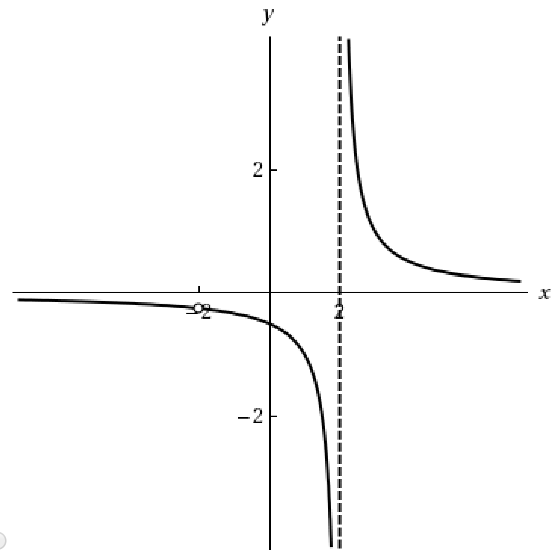
Explain why the function is discontinuous at the given number *a*. (Select all that apply.)

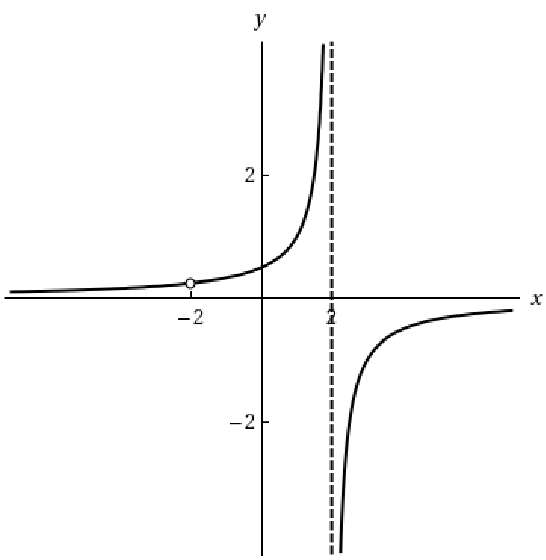
$$f(x) = \frac{1}{x + 2} \qquad a = -2$$

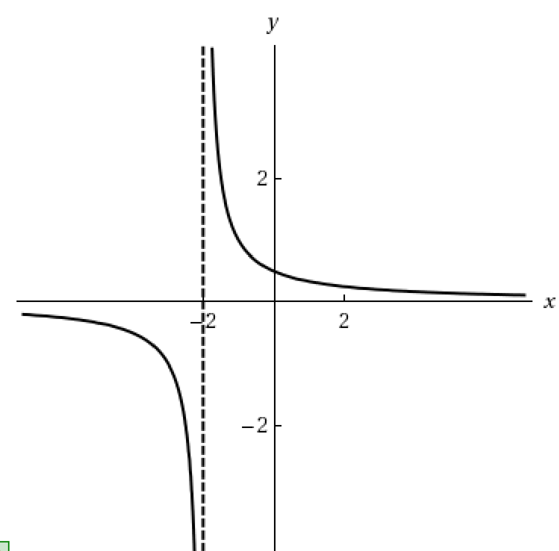
- [x] $\lim_{x \to -2} f(x)$ does not exist.
- [ ] $f(-2)$ and $\lim_{x \to -2} f(x)$ exist, but are not equal.
- [ ] $\lim_{x \to -2^+} f(x)$ and $\lim_{x \to -2^-} f(x)$ exist, but are not equal.
- [x] $f(-2)$ is undefined.
- [ ] none of the above

Sketch the graph of the function.



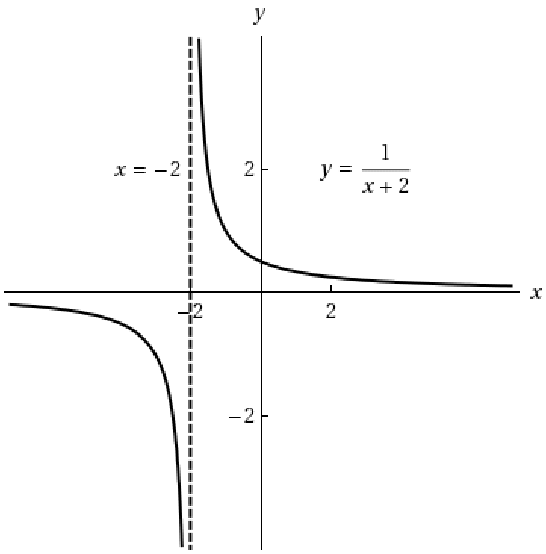






Solution or Explanation

$f(x) = \dfrac{1}{x+2}$ is discontinuous at $a = -2$ because $f(-2)$ is undefined. Also, since $\lim_{x \to -2^+} f(x) = \infty \neq -\infty = \lim_{x \to -2^-} f(x)$, $\lim_{x \to -2} f(x)$ does not exist.



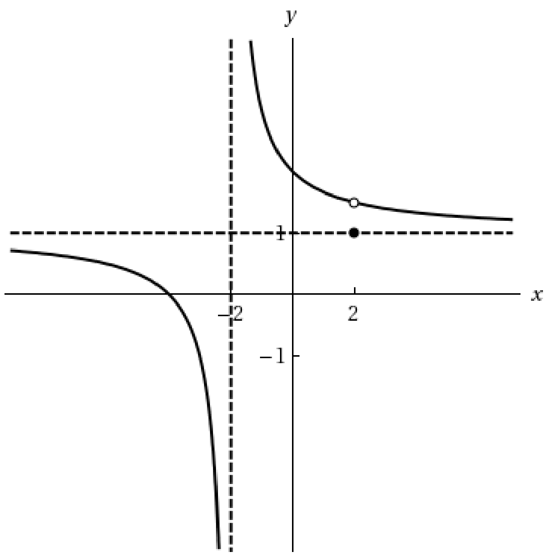
3. 2/2 points | Previous Answers SCalcET8 2.5.020.

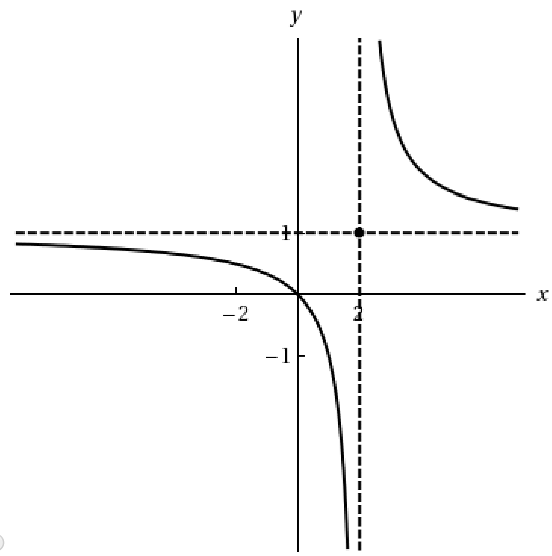
Explain why the function is discontinuous at the given number a. (Select all that apply.)

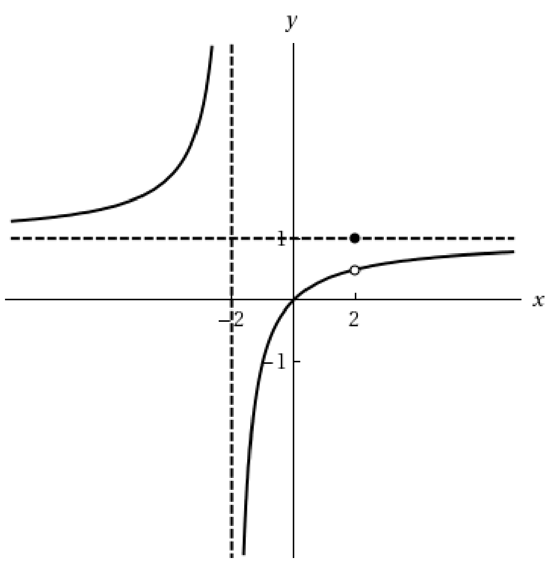
$$f(x) = \begin{cases} \dfrac{x^2 - 2x}{x^2 - 4} & \text{if } x \neq 2 \\ 1 & \text{if } x = 2 \end{cases} \qquad a = 2$$

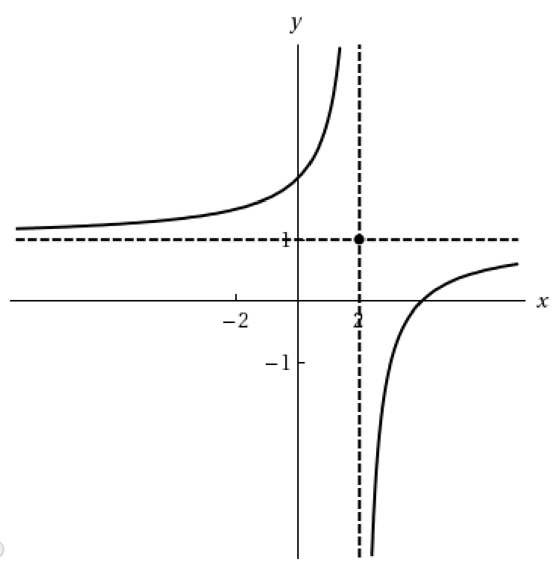
- [ ] $\lim_{x \to 2} f(x)$ does not exist.
- [ ] $f(2)$ is undefined.
- [x] $f(2)$ is defined and $\lim_{x \to 2} f(x)$ is finite, but they are not equal.
- [ ] $\lim_{x \to 2^+} f(x)$ and $\lim_{x \to 2^-} f(x)$ are finite, but are not equal.
- [ ] none of the above

Sketch the graph of the function.





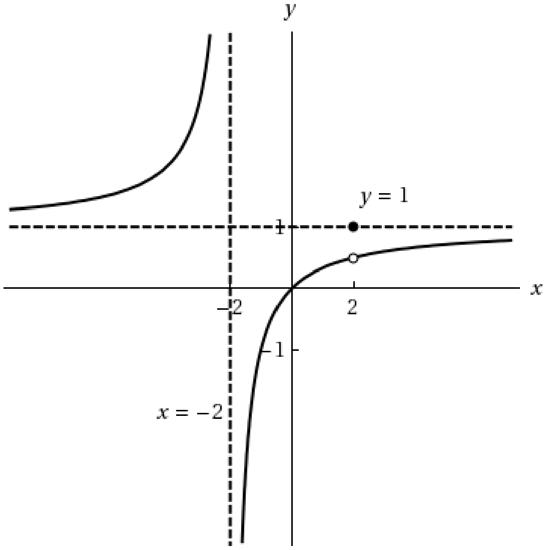




Solution or Explanation

$$f(x) = \begin{cases} \dfrac{x^2 - 2x}{x^2 - 4} & \text{if } x \neq 2 \\ 1 & \text{if } x = 2 \end{cases}$$

$\lim\limits_{x \to 2} f(x) = \lim\limits_{x \to 2} \dfrac{x^2 - 2x}{x^2 - 4} = \lim\limits_{x \to 2} \dfrac{x(x-2)}{(x+2)(x-2)} = \lim\limits_{x \to 2} \dfrac{x}{x+2} = \dfrac{1}{2}$, but $f(2) = 1$. Thus, $f(2) \neq \lim\limits_{x \to 2} f(x)$, so f is discontinuous at 2.



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4. 2/2 points | Previous Answers SCalcET8 2.5.023.

How would you "remove the discontinuity" of f? In other words, how would you define $f(2)$ in order to make f continuous at 2?

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

$f(2) = \boxed{3}$ ✓ 3

Solution or Explanation

$f(x) = \dfrac{x^2 - x - 2}{x - 2} = \dfrac{(x-2)(x+1)}{x-2} = x + 1$ for $x \neq 2$. Since $\lim\limits_{x \to 2} f(x) = 2 + 1 = 3$, define $f(2) = 3$. Then f is continuous at 2.

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5. 1/1 points | Previous Answers SCalcET8 2.5.035.

Use continuity to evaluate the limit.

$$\lim_{x \to 3} x\sqrt{18 - x^2}$$

$\boxed{9}$ ✓ 9

Solution or Explanation

Because x is continuous on $\mathbb{R}$ and $\sqrt{18 - x^2}$ is continuous on its domain, $-\sqrt{18} \le x \le \sqrt{18}$, the product $f(x) = x\sqrt{18 - x^2}$ is continuous on $-\sqrt{18} \le x \le \sqrt{18}$. The number 3 is in that domain, so f is continuous at 3, and $\lim\limits_{x \to 3} f(x) = f(3) = 3\sqrt{9} = 9$.

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6. 2/2 points | Previous Answers SCalcET8 2.5.045.MI.

For what value of the constant c is the function f continuous on $(-\infty, \infty)$?

$$f(x) = \begin{cases} cx^2 + 4x & \text{if } x < 5 \\ x^3 - cx & \text{if } x \ge 5 \end{cases}$$

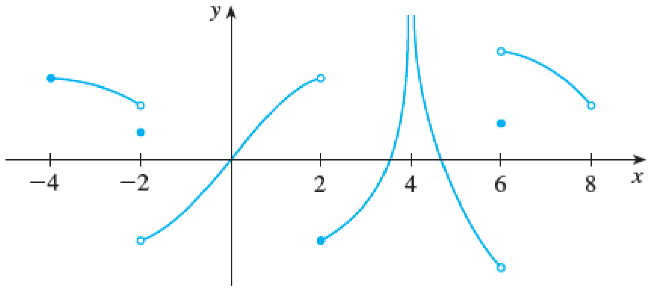
$c = \boxed{7/2}$ ✓ 7/2

Solution or Explanation

Click to View Solution

7. 1/1 points | Previous AnswersSCalcET8 2.5.501.XP.

From the graph of g, state the intervals on which g is continuous.



- [−4, 8)
- (selected) [−4, −2), (−2, 2), [2, 4), (4, 6), (6, 8)
- [−4, −2), (−2, 4), (4, 6), (6, 8)
- [−4, −2), (−2, 2), [2, 6), (6, 8)
- [−4, −2), (−2, 6), (6, 8)

Solution or Explanation
Click to View Solution

8. 2/0 points | Previous AnswersSCalcET8 2.5.046.

Find the values of a and b that make f continuous everywhere.

$$f(x) = \begin{cases} \dfrac{x^2 - 4}{x - 2} & \text{if } x < 2 \\ ax^2 - bx + 3 & \text{if } 2 \le x < 3 \\ 4x - a + b & \text{if } x \ge 3 \end{cases}$$

a = 7/2 ✓ 7/2

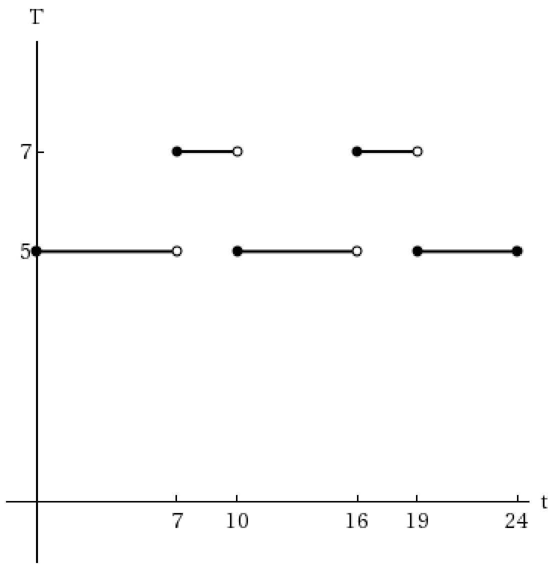
b = 13/2 ✓ 13/2

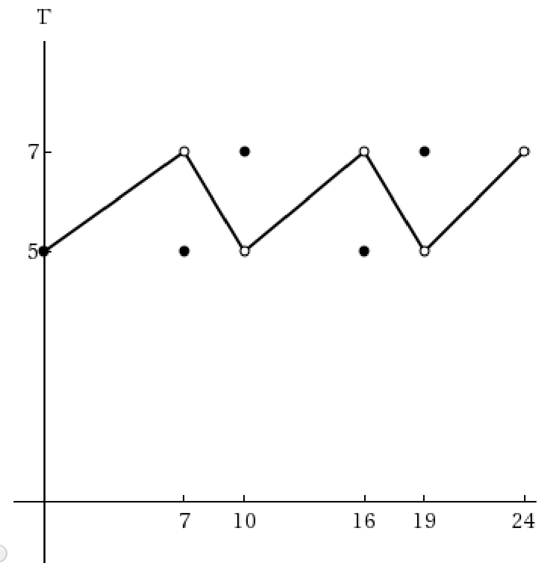
Solution or Explanation
Click to View Solution

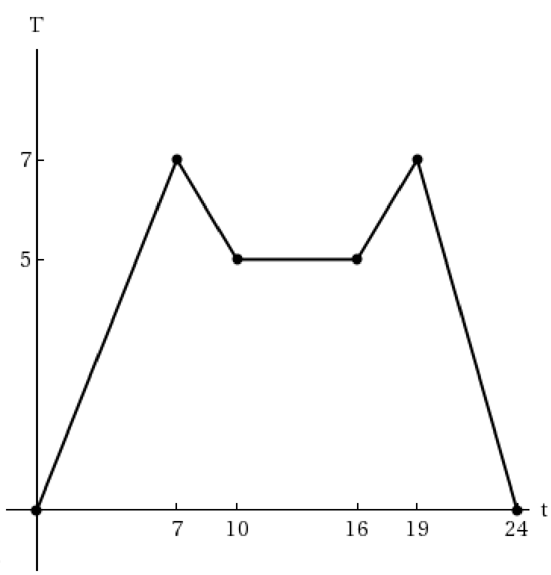
9. 2/0 points | Previous AnswersSCalcET8 2.5.009.

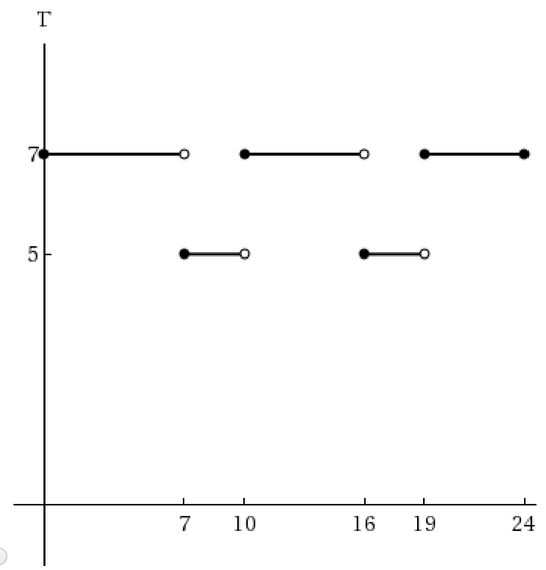
The toll *T* charged for driving on a certain stretch of a toll road is $5 except during rush hours (between 7 AM and 10 AM and between 4 PM and 7 PM) when the toll is $7.

(a) Sketch a graph of *T* as a function of the time *t*, measured in hours past midnight.









(b) Locate the discontinuities of *T*. (Enter your answers as a comma-separated list. If an answer does not exist, enter DNE.)

t =

$$7,10,16,19

7, 10, 16, 19

Classify the discontinuities as removable, jump, or infinite.

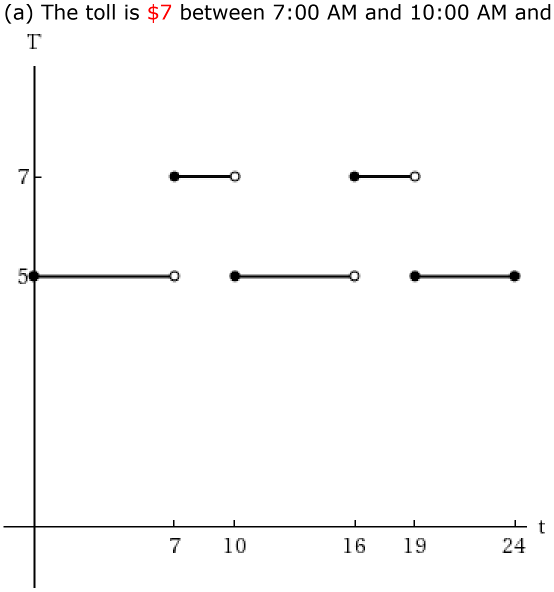
- removable
- (selected) jump
- infinite
- none — T is continuous

Discuss the significance of the discontinuities of T to someone who uses the road.

- The function is continuous, so there is no significance.
- (selected) Because of the sudden jumps in the toll, drivers may want to avoid the higher rates between $t = 7$ and $t = 10$ and between $t = 16$ and $t = 19$ if feasible.
- Because of the steady increases and decreases in the toll, drivers may want to avoid the highest rates at $t = 7$ and $t = 24$ if feasible.
- Because of the sudden jumps in the toll, drivers may want to avoid the higher rates between $t = 0$ and $t = 7$, between $t = 10$ and $t = 16$, and between $t = 19$ and $t = 24$ if feasible.

Solution or Explanation

(a) The toll is \$7 between 7:00 AM and 10:00 AM and \$5 between 4:00 PM and 7:00 PM.



(b) The function T has jump discontinuities at $t = 7$, 10, 16, and 19. Their significance to someone who uses the road is that, because of the sudden jumps in the toll, they may want to avoid the higher rates between $t = 7$ and $t = 10$ and between $t = 16$ and $t = 19$ if feasible.

10.2.5/2.5 points | Previous AnswersSCalcET8 2.6.002.

(a) Can the graph of $y = f(x)$ intersect a vertical asymptote?

- (●) Yes
- ( ) No

Can it intersect a horizontal asymptote?

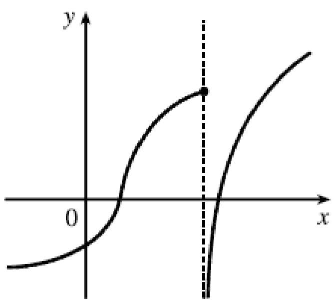
- (●) Yes
- ( ) No

(b) How many horizontal asymptotes can the graph of $y = f(x)$ have? (Select all that apply.)

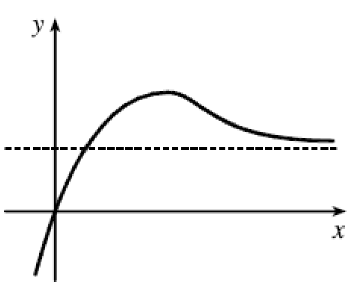
- [x] 0
- [x] 1
- [x] 2
- [ ] 3
- [ ] 4

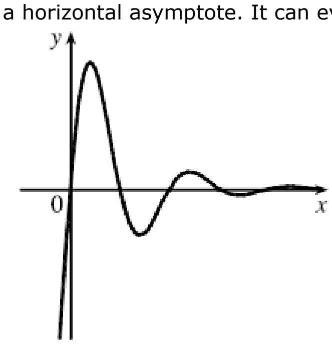
Solution or Explanation

(a) The graph of a function can intersect a vertical asymptote in the sense that it can meet but not cross it.

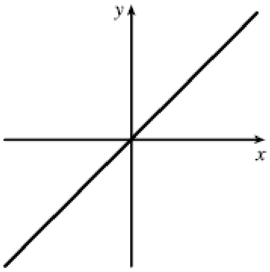


The graph of a function can intersect a horizontal asymptote. It can even intersect its horizontal asymptote an infinite number of times.

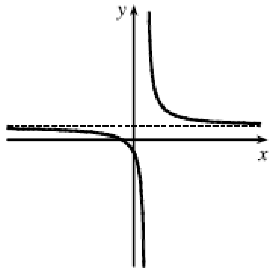




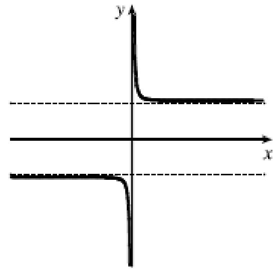
(b) The graph of a function can have 0, 1, or 2 horizontal asymptotes. Representative examples are shown.



No horizontal asymptote



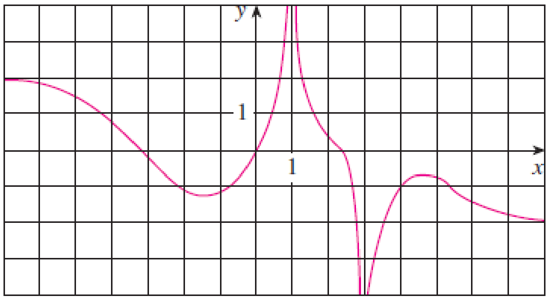
One horizontal asymptote



Two horizontal asymptotes

11.3/3 points | Previous AnswersSCalcET8 2.6.003.

For the function *f* whose graph is given, state the following.



(a) $\lim_{x \to \infty} f(x)$

$$−2

✓ -2

(b) $\lim_{x \to -\infty} f(x)$

$$2

✓ 2

(c) $\lim_{x \to 1} f(x)$

$$∞

✓ ∞

(d) $\lim_{x \to 3} f(x)$

$$−∞

✓ $-\infty$

(e) the equations of the asymptotes (Enter your answers as a comma-separated list of equations.)

vertical

$$x=1,x=3

✓ $x = 1, x = 3$

horizontal

$$y=−2,y=2

✓ $y = -2, y = 2$

Solution or Explanation

(a) $\lim_{x \to \infty} f(x) = -2$

(b) $\lim_{x \to -\infty} f(x) = 2$

(c) $\lim_{x \to 1} f(x) = \infty$

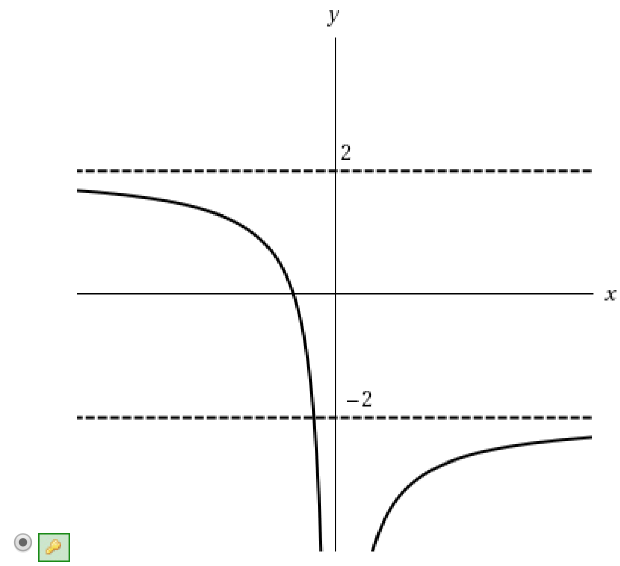
(d) $\lim_{x \to 3} f(x) = -\infty$

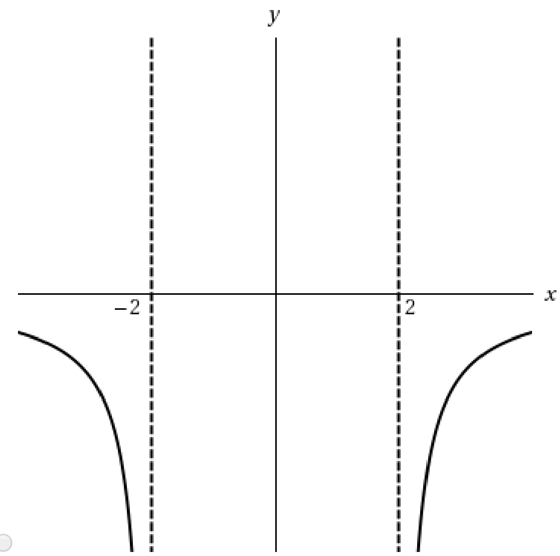
(e) Vertical: $x = 1$, $x = 3$; horizontal: $y = -2$, $y = 2$

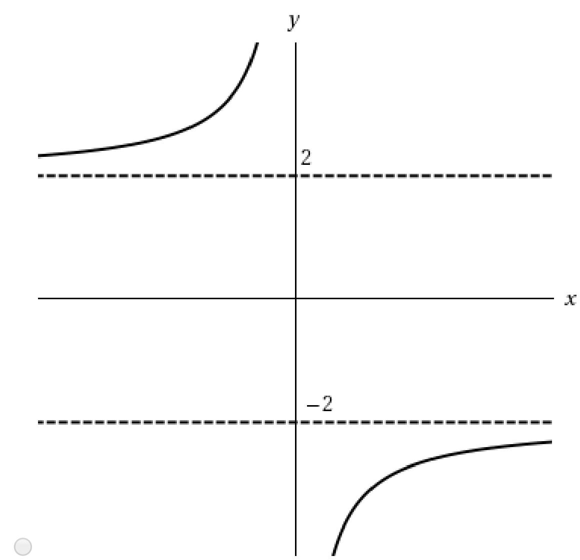
12.1/1 points | Previous AnswersSCalcET8 2.6.005.

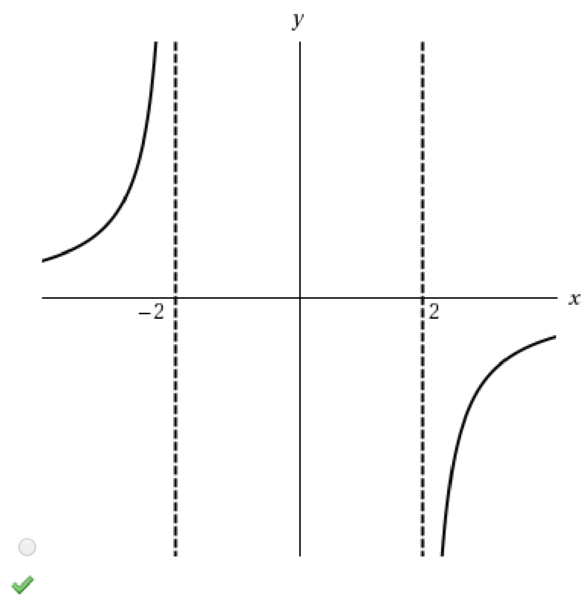
Sketch the graph of an example of a function that satisfies all of the given conditions.

$\lim_{x \to 0} f(x) = -\infty, \quad \lim_{x \to -\infty} f(x) = 2, \quad \lim_{x \to \infty} f(x) = -2$



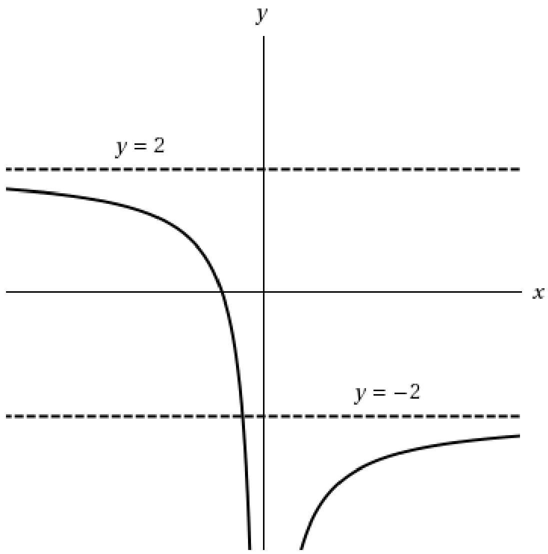






Solution or Explanation

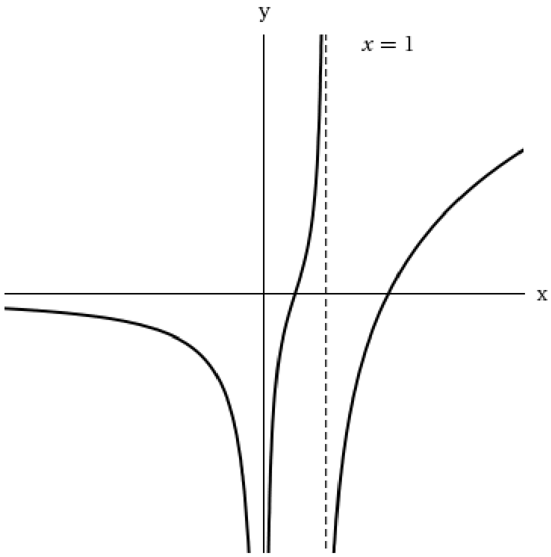
$\lim_{x \to 0} f(x) = -\infty$,
$\lim_{x \to -\infty} f(x) = 2$,
$\lim_{x \to \infty} f(x) = -2$

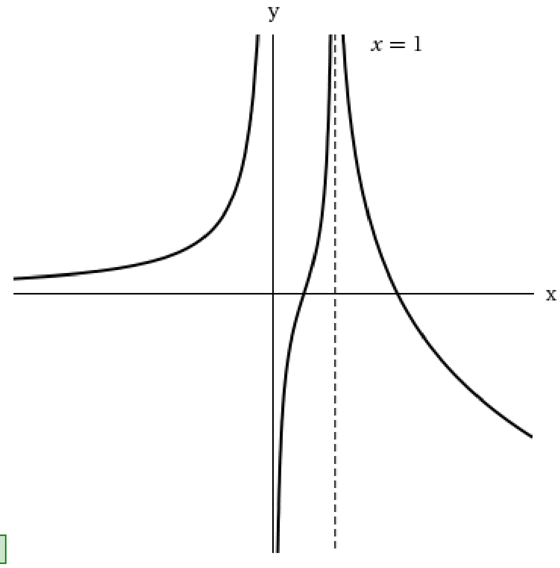


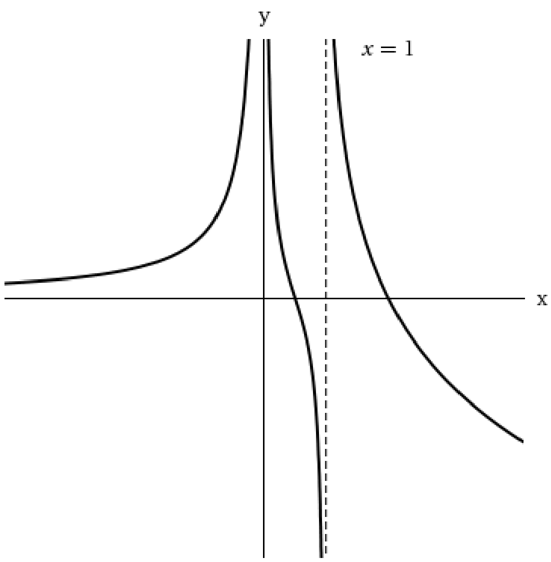
13. 1/1 points | Previous Answers SCalcET8 2.6.007.

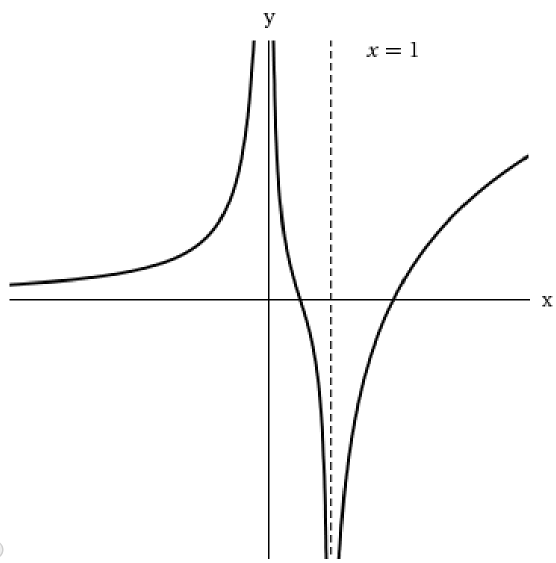
Sketch the graph of an example of a function that satisfies all of the given conditions.

$$\lim_{x \to 1} f(x) = \infty, \quad \lim_{x \to \infty} f(x) = -\infty, \quad \lim_{x \to -\infty} f(x) = 0, \quad \lim_{x \to 0^+} f(x) = -\infty, \quad \lim_{x \to 0^-} f(x) = \infty$$



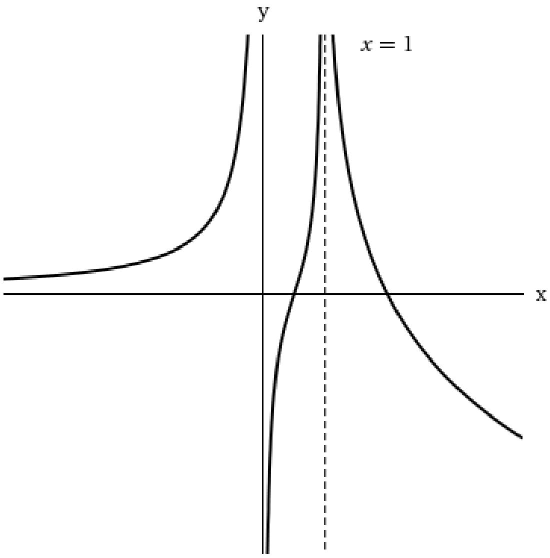






Solution or Explanation

$\lim_{x \to 1} f(x) = \infty$, $\lim_{x \to \infty} f(x) = -\infty$,
$\lim_{x \to -\infty} f(x) = 0$, $\lim_{x \to 0^+} f(x) = -\infty$,
$\lim_{x \to 0^-} f(x) = \infty$



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14. 1/1 points | Previous Answers SCalcET8 2.6.013.

Evaluate the limit using the appropriate properties of limits. (If an answer does not exist, enter DNE.)

$$\lim_{x \to \infty} \frac{8x^2 - 5}{7x^2 + x - 3}$$

$$87

$\boxed{\frac{8}{7}}$

Solution or Explanation

$$\lim_{x \to \infty} \frac{8x^2 - 5}{7x^2 + x - 3} = \lim_{x \to \infty} \frac{(8x^2 - 5)/x^2}{(7x^2 + x - 3)/x^2}$$

[Divide both the numerator and denominator by x^2 (the highest power of x that appears in the denominator)]

$$= \frac{\lim_{x \to \infty} (8 - 5/x^2)}{\lim_{x \to \infty} (7 + 1/x - 3/x^2)}$$

[Limit Law 5]

$$= \frac{\lim_{x \to \infty} 8 - \lim_{x \to \infty} (5/x^2)}{\lim_{x \to \infty} 7 + \lim_{x \to \infty} (1/x) - \lim_{x \to \infty} (3/x^2)}$$

[Limit Laws 1 and 2]

$$= \frac{8 - 5 \lim_{x \to \infty} (1/x^2)}{7 + \lim_{x \to \infty} (1/x) - 3 \lim_{x \to \infty} (1/x^2)}$$

[Limit Laws 7 and 3]

$$= \frac{8 - 5(0)}{7 + 0 + 3(0)}$$

[Theorem 5 of this section]

$$= \frac{8}{7}$$

15. 1/1 points | Previous Answers SCalcET8 2.6.017.

Find the limit, if it exists. (If an answer does not exist, enter DNE.)

$$\lim_{x \to -\infty} \frac{x - 9}{x^2 + 9}$$

$$0

0

Solution or Explanation

$$\lim_{x \to -\infty} \frac{x - 9}{x^2 + 9} = \lim_{x \to -\infty} \frac{(x - 9)/x^2}{(x^2 + 9)/x^2} = \lim_{x \to -\infty} \frac{1/x - 9/x^2}{1 + 9/x^2} = \frac{\lim_{x \to -\infty} 1/x - 9 \lim_{x \to -\infty} 1/x^2}{\lim_{x \to -\infty} 1 + \lim_{x \to -\infty} 1/x^2} = \frac{0 - 9(0)}{1 + 0} = 0$$

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16. 2/2 points | Previous Answers SCalcET8 2.6.022.

Find the limit, if it exists. (If an answer does not exist, enter DNE.)

$$\lim_{x \to \infty} \frac{x^4}{\sqrt{x^8 + 1}}$$

$$1

1

Solution or Explanation

$$\lim_{x \to \infty} \frac{x^4}{\sqrt{x^8 + 1}} = \lim_{x \to \infty} \frac{x^4/x^4}{\left(\sqrt{x^8 + 1}\right)/x^4}$$

$$= \lim_{x \to \infty} \frac{1}{\sqrt{(x^8 + 1)/x^8}} \quad \left[\text{since } x^4 = \sqrt{x^8} \text{ for } x > 0\right]$$

$$= \lim_{x \to \infty} \frac{1}{\sqrt{1 + 1/x^8}}$$

$$= \frac{1}{\sqrt{1 + 0}}$$

$$= 1$$

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17. 1/1 points | Previous Answers SCalcET8 2.6.031.

Find the limit, if it exists. (If an answer does not exist, enter DNE.)

$$\lim_{x \to \infty} \frac{x^4 - 9x^2 + x}{x^3 - x + 5}$$

$$∞

DNE

Solution or Explanation

$$\lim_{x \to \infty} \frac{x^4 - 9x^2 + x}{x^3 - x + 5} = \lim_{x \to \infty} \frac{(x^4 - 9x^2 + x)/x^3}{(x^3 - x + 5)/x^3} \left[\begin{array}{c}\text{divide by the highest power}\\ \text{of } x \text{ in the denominator}\end{array}\right] = \lim_{x \to \infty} \frac{x - 9/x + 1/x^2}{1 - 1/x^2 + 5/x^3} = \infty$$ since the numerator increases without bound and the denominator approaches 1 as $x \to \infty$.

18.1/1 points | Previous AnswersSCalcET8 2.6.033.

Find the limit, if it exists. (If an answer does not exist, enter DNE.)

$$\lim_{x \to -\infty} (x^6 + 2x^9)$$

$$-∞

DNE

Solution or Explanation

$\lim_{x \to -\infty} (x^6 + 2x^9) = \lim_{x \to -\infty} x^9\left(\frac{1}{x^3} + 2\right)$ [factor out the largest power of x] $= -\infty$ because $x^9 \to -\infty$ and $1/x^3 + 2 \to 2$ as $x \to -\infty$.

Or: $\lim_{x \to -\infty} (x^6 + 2x^9) = \lim_{x \to -\infty} x^6(1 + 2x^3) = -\infty$.

19.1.5/1.5 points | Previous AnswersSCalcET8 2.6.049.

Find the horizontal and vertical asymptotes of the curve.

$$y = \frac{5x^2 + x - 4}{x^2 + x - 90}$$

$x =$ -10 -10 (smaller x-value)

$x =$ 9 9 (larger x-value)

$y =$ 5 5

Solution or Explanation

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20.2/2 points | Previous Answersscalcet8 2.6.050.defective

Find the horizontal and vertical asymptotes of the curve.

$$y = \frac{7 + x^4}{x^2 - x^4}$$

$x =$ -1 -1 (smallest x-value)

$x =$ 0 0

$x =$ 1 1 (largest x-value)

$y =$ -1 -1

Solution or Explanation

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21.2/2 points | Previous AnswersSCalcET8 2.6.068.

A tank contains 2000 L of pure water. Brine that contains 15 g of salt per liter of water is pumped into the tank at a rate of 25 L/min. The concentration of salt after t minutes (in grams per liter) is

$$C(t) = \frac{15t}{80 + t}.$$

As $t \to \infty$, what does the concentration approach?

15 15 g/L

Solution or Explanation

Click to View Solution

22. 2/2 points | Previous Answers SCalcET8 2.6.511.XP.

Find the limit, if it exists. (If an answer does not exist, enter DNE.)

$$\lim_{u \to \infty} \frac{2u^4 + 9}{(u^2 - 6)(2u^2 - 1)}$$

$$1

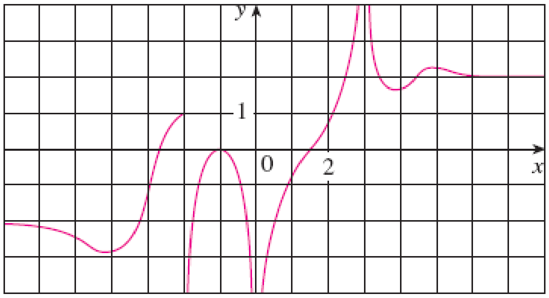
$\boxed{1}$

Solution or Explanation

Click to View Solution

23. 2/2 points | Previous Answers SCalcET8 2.6.519.XP.

For the function g whose graph is given, state the following.



(a) $\lim_{x \to \infty} g(x)$

$$2

2

(b) $\lim_{x \to -\infty} g(x)$

$$−2

-2

(c) $\lim_{x \to 3} g(x)$

$$∞

∞

(d) $\lim_{x \to 0} g(x)$

$$−∞

$-\infty$

(e) $\lim_{x \to -2^+} g(x)$

$$−∞

$-\infty$

(f) The equations of the asymptotes (Enter your answers as a comma-separated list.)

vertical

$$x=−2,x=0,x=3

$x = 3, x = -2, x = 0$

horizontal

$$y=−2,y=2

$y = -2, y = 2$

Solution or Explanation

Click to View Solution

24.2/0 points | Previous AnswersSCalcET8 2.6.027.

Find the limit, if it exists. (If an answer does not exist, enter DNE.)

$$\lim_{x \to \infty} \left(\sqrt{16x^2 + x} - 4x \right)$$

1/8 1/8

Solution or Explanation

Click to View Solution

25.2/0 points | Previous AnswersSCalcET8 2.6.058.

Find a formula for a function that has vertical asymptotes $x = 1$ and $x = 7$ and horizontal asymptote $y = 1$.

$f(x) =$

$$x2x2−8x−7

$$\frac{x^2}{(x-7)(x-1)}$$

Solution or Explanation

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