WebAssign
2.2 - 2.3 Límites (Homework)

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Diferencial, section B, Spring 2019
Instructor: Christiaan Ketelaar

Current Score : 54 / 45 **Due :** Saturday, February 16, 2019 11:59 PM CST**Last Saved : n/a Saving... ()**

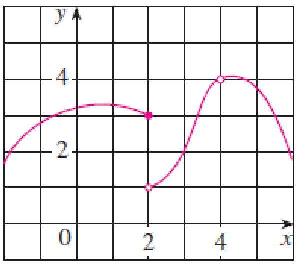
The due date for this assignment is past. Your work can be viewed below, but no changes can be made.

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. 2/2 points | Previous AnswersSCalc8 1.5.004.

Use the given graph of *f* to state the value of each quantity, if it exists. (If an answer does not exist, enter DNE.)



(a) $\lim_{x \to 2^-} f(x)$
3 ✓ 3

(b) $\lim_{x \to 2^+} f(x)$
1 ✓ 1

(c) $\lim_{x \to 2} f(x)$
DNE ✓ DNE

(d) $f(2)$
3 ✓ 3

(e) $\lim_{x \to 4} f(x)$
4 ✓ 4

(f) $f(4)$
DNE ✓ DNE

Solution or Explanation

(a) As x approaches 2 from the left, the values of $f(x)$ approach 3, so $\lim_{x \to 2^-} f(x) = 3$.

(b) As x approaches 2 from the right, the values of $f(x)$ approach 1, so $\lim_{x \to 2^+} f(x) = 1$.

(c) $\lim_{x \to 2} f(x)$ does not exist since the left-hand limit does not equal the right-hand limit.

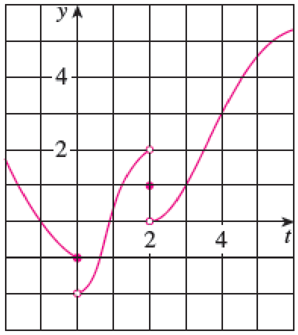
(d) When $x = 2$, $y = 3$, so $f(2) = 3$.

(e) As x approaches 4, the values of $f(x)$ approach 4, so $\lim_{x \to 4} f(x) = 4$.

(f) There is no value of $f(x)$ when $x = 4$, so $f(4)$ does not exist.

2. 2/2 points | Previous Answers SCalc8 1.5.007.

For the function g whose graph is given, state the value of each quantity, if it exists. (If an answer does not exist, enter DNE.)



(a) $\lim_{t \to 0^-} g(t)$

-1 ✓ -1

(b) $\lim_{t \to 0^+} g(t)$

-2 ✓ -2

(c) $\lim_{t \to 0} g(t)$

DNE ✓ DNE

(d) $\lim_{t \to 2^-} g(t)$

2 ✓ 2

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

0 ✓ 0

(f) $\lim_{t \to 2} g(t)$

DNE ✓ DNE

(g) $g(2)$

1 ✓ 1

(h) $\lim_{t \to 4} g(t)$

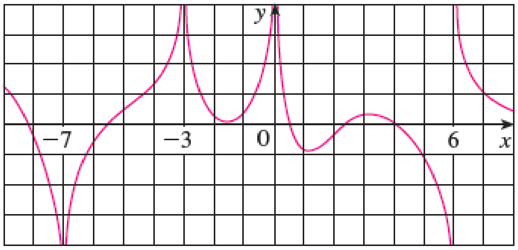
3 ✓ 3

Solution or Explanation

Click to View Solution

3. 2/2 points | Previous AnswersSCalc8 1.5.009.

For the function *f* whose graph is shown, state the following. (If an answer does not exist, enter DNE.)



(a) $\lim_{x \to -7} f(x)$

$$−∞

$\boxed{-\infty}$

(b) $\lim_{x \to -3} f(x)$

$$∞

$\boxed{\infty}$

(c) $\lim_{x \to 0} f(x)$

$$∞

$\boxed{\infty}$

(d) $\lim_{x \to 6^-} f(x)$

$$−∞

$\boxed{-\infty}$

(e) $\lim_{x \to 6^+} f(x)$

$$∞

$\boxed{\infty}$

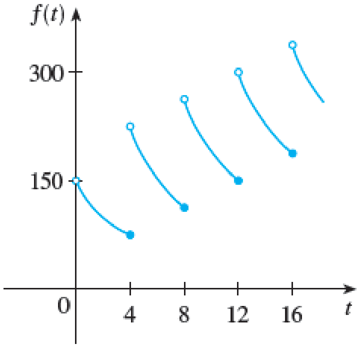
(f) The equations of the vertical asymptotes.

$x =$ -7 -7 (smallest value)
$x =$ -3 -3
$x =$ 0 0
$x =$ 6 6 (largest value)

Solution or Explanation
Click to View Solution

4. 1/1 points | Previous AnswersSCalc8 1.5.010.MI.

A patient receives a 150-mg injection of a drug every 4 hours. The graph shows the amount $f(t)$ of the drug in the bloodstream after t hours.



Find $\lim_{t \to 4^-} f(t)$ and $\lim_{t \to 4^+} f(t)$.

$\lim_{t \to 4^-} f(t) = \boxed{75}$ ✔ 75 mg

$\lim_{t \to 4^+} f(t) = \boxed{225}$ ✔ 225 mg

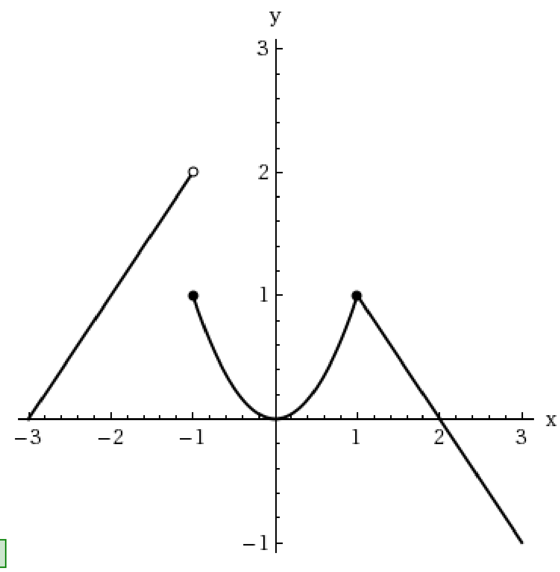
Solution or Explanation

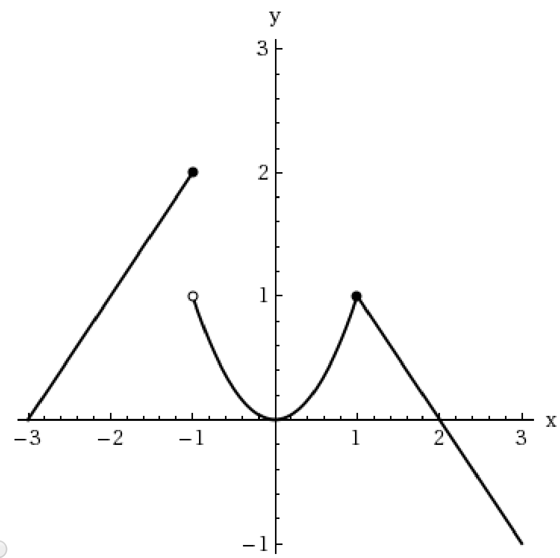
$\lim_{t \to 4^-} f(t) = 75$ mg and $\lim_{t \to 4^+} f(t) = 225$ mg. These limits show that there is an abrupt change in the amount of drug in the patient's bloodstream at $t = 4$ h. The left-hand limit represents the amount of the drug just before the second injection. The right-hand limit represents the amount of the drug just after the second injection.

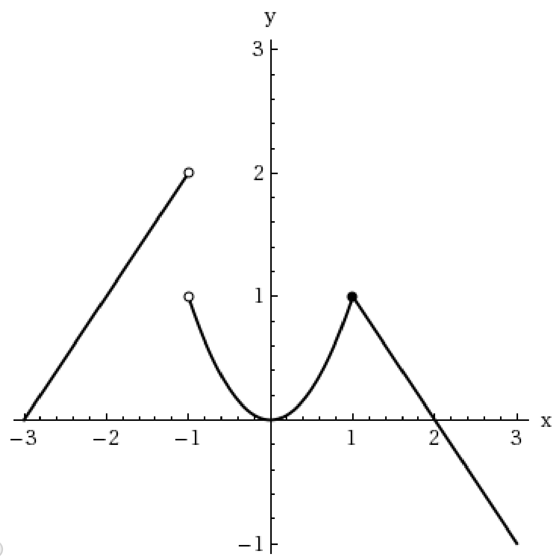
5. 2/2 points | Previous AnswersSCalc8 1.5.011.

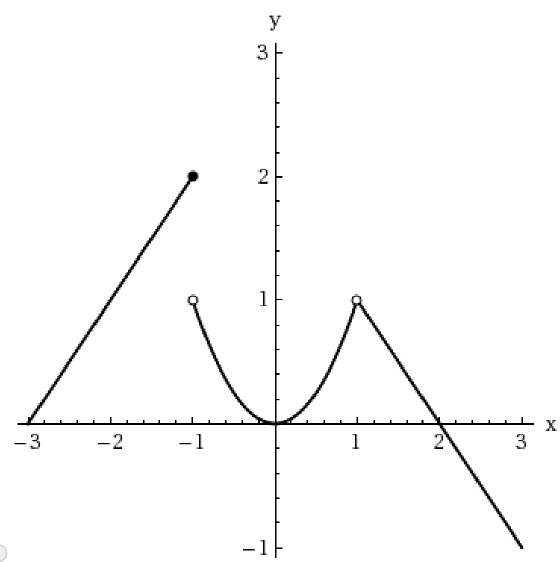
Sketch the graph of the function.

$$f(x) = \begin{cases} 3 + x & \text{if } x < -1 \\ x^2 & \text{if } -1 \le x < 1 \\ 2 - x & \text{if } x \ge 1 \end{cases}$$









Use the graph to determine the values of a for which $\lim_{x \to a} f(x)$ does not exist. (Enter your answers as a comma-separated list.)

a =
$$−1

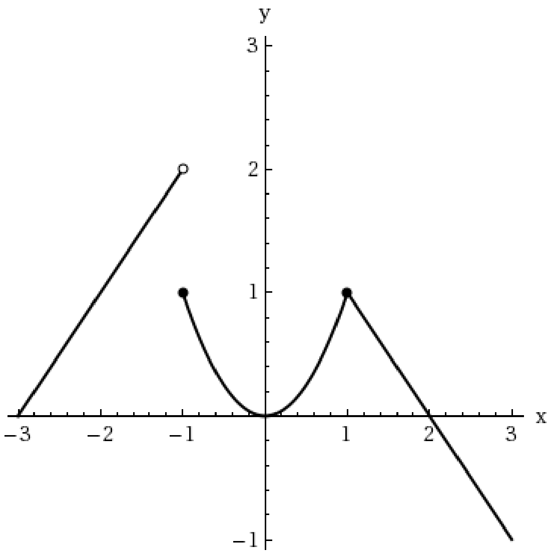
-1

Solution or Explanation

From the graph of

$$f(x) = \begin{cases} 3 + x & \text{if } x < -1 \\ x^2 & \text{if } -1 \le x < 1 \\ 2 - x & \text{if } x \ge 1 \end{cases}$$

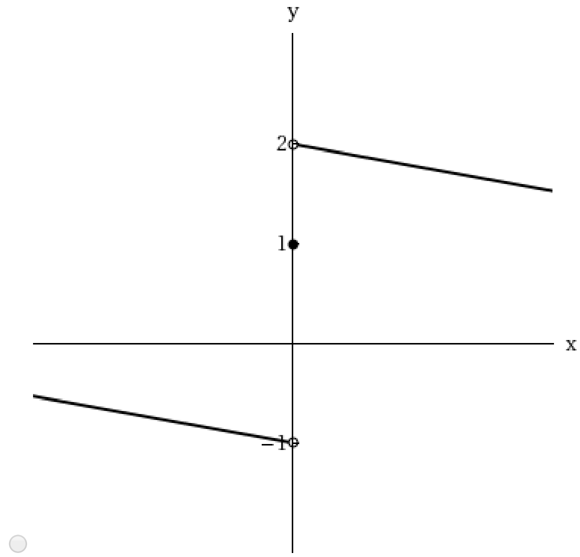
we see that $\lim_{x \to a} f(x)$ exists for all a except $a = -1$. Notice that the right and left limits are different at $a = -1$.

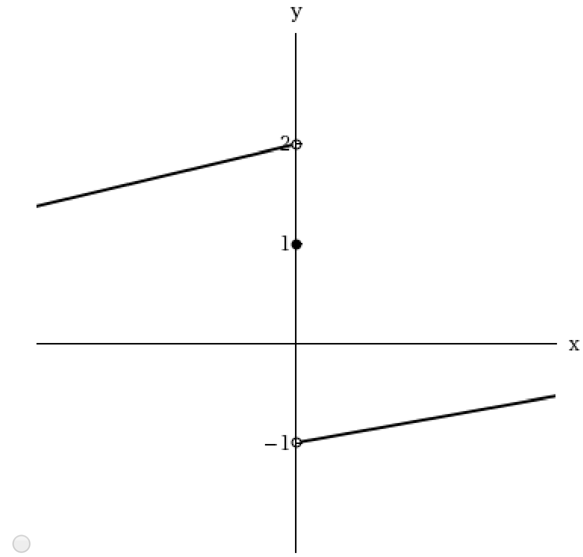


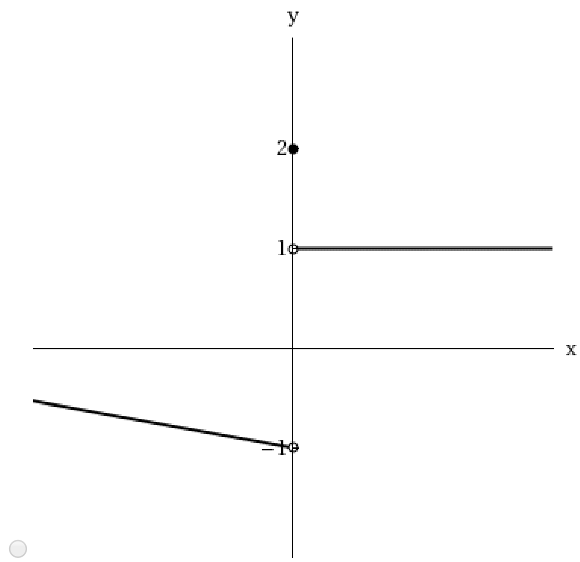
6. 1/1 points | Previous AnswersSCalc8 1.5.015.

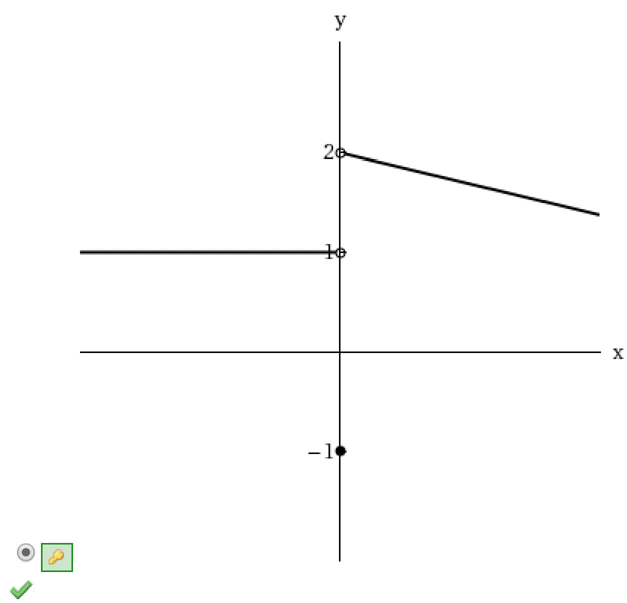
Sketch the graph of an example of a function *f* that satisfies all of the given conditions.

$\lim_{x \to 0^-} f(x) = 1, \quad \lim_{x \to 0^+} f(x) = 2, \quad f(0) = -1$



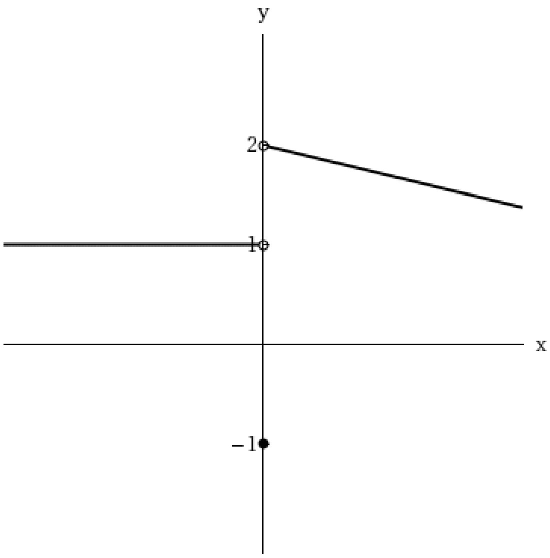






Solution or Explanation

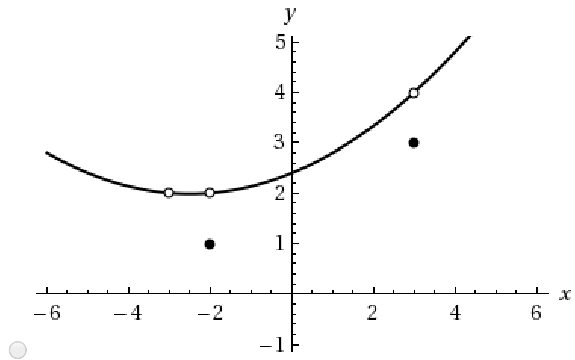
$\lim_{x \to 0^-} f(x) = 1$, $\lim_{x \to 0+} f(x) = 2$, $f(0) = 1$

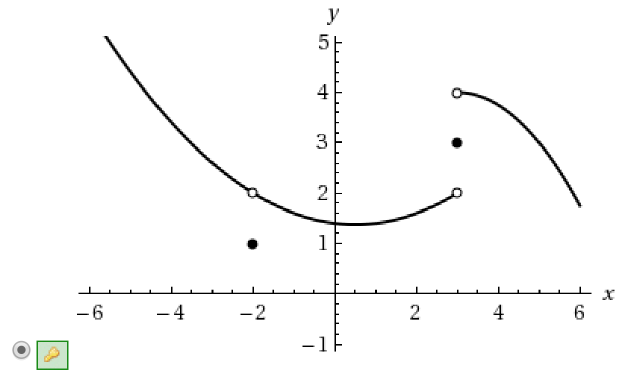


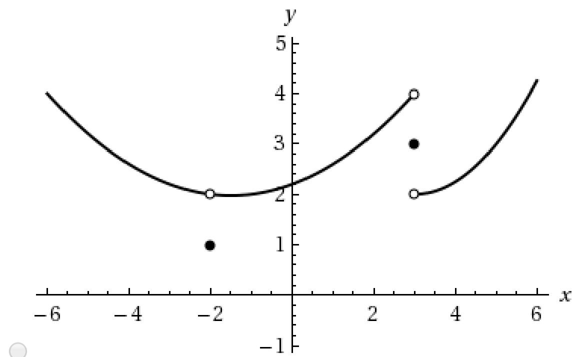
7. 1/1 points | Previous AnswersSCalc8 1.5.017.

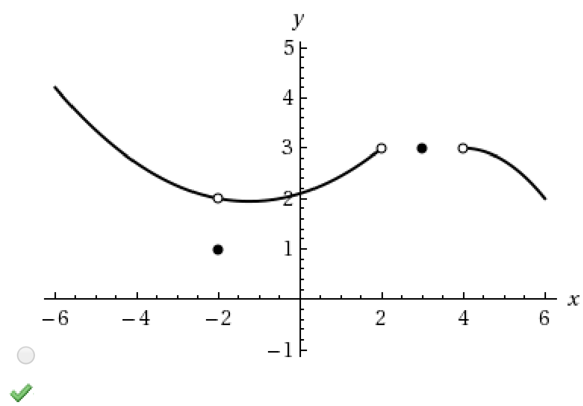
Sketch the graph of an example of a function *f* that satisfies all of the given conditions.

$\lim_{x \to 3^+} f(x) = 4, \quad \lim_{x \to 3^-} f(x) = 2, \quad \lim_{x \to -2} f(x) = 2, \quad f(3) = 3, \quad f(-2) = 1$



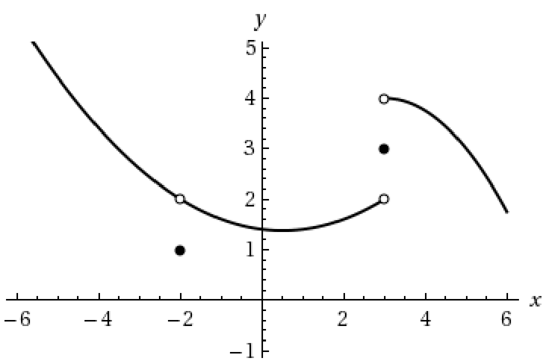






Solution or Explanation

$\lim_{x \to 3^+} f(x) = 4, \quad \lim_{x \to 3^-} f(x) = 2, \quad \lim_{x \to -2} f(x) = 2, \quad f(3) = 3, \quad f(-2) = 1$



8. 1/1 points | Previous Answers SCalc8 1.5.029.

Determine the infinite limit.

$$\lim_{x \to 3^+} \frac{x + 2}{x - 3}$$

- (selected) ∞
- $-\infty$

Solution or Explanation

$\lim_{x \to 3^+} \frac{x + 2}{x - 3} = \infty$ since the numerator is positive and the denominator approaches 0 from the positive side as $x \to 3^+$.

9. 1/1 points | Previous Answers SCalc8 1.5.038.

Determine the infinite limit.

$$\lim_{x \to 6^-} \frac{x^2 - 6x}{x^2 - 12x + 36}$$

- ∞
- (selected) $-\infty$

Solution or Explanation

Click to View Solution

10. 2/2 points | Previous Answers SCalc8 1.5.041.

Evaluate the function for values of x that approach 1 from the left and from the right.

$$f(x) = \frac{6}{x^3 - 1}$$

$\lim_{x \to 1^-} f(x) =$

$$-\infty

$-\infty$

$\lim_{x \to 1^+} f(x) =$

$$\infty

∞

Solution or Explanation

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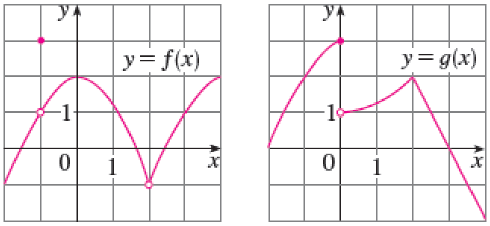
11.2/2 points | Previous AnswersSCalc8 1.6.002.

The graphs of f and g are given. Use them to evaluate each limit, if it exists. (If an answer does not exist, enter DNE.)



(a) $\lim_{x \to 2} [f(x) + g(x)]$

1 ✔ 1

(b) $\lim_{x \to 0} [f(x) - g(x)]$

DNE ✔ DNE

(c) $\lim_{x \to -1} [f(x)g(x)]$

2 ✔ 2

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

DNE ✔ DNE

(e) $\lim_{x \to 2} [x^2 f(x)]$

-4 ✔ -4

(f) $f(-1) + \lim_{x \to -1} g(x)$

5 ✔ 5

Solution or Explanation

(a) $\lim_{x \to 2} [f(x) + g(x)] = \lim_{x \to 2} f(x) + \lim_{x \to 2} g(x)$ [Limit Law 1]
$= -1 + 2$
$= 1$

(b) $\lim_{x \to 0} f(x)$ exists, but $\lim_{x \to 0} g(x)$ does not exist, so we cannot apply Limit Law 2 to $\lim_{x \to 0} [f(x) - g(x)]$. The limit does not exist.

(c) $\lim_{x \to -1} [f(x)g(x)] = \lim_{x \to -1} f(x) \cdot \lim_{x \to -1} g(x)$ [Limit Law 4]
$= 1 \cdot 2$
$= 2$

(d) $\lim_{x \to 3} f(x) = 1$, but $\lim_{x \to 3} g(x) = 0$, so we cannot apply Limit Law 5 to $\lim_{x \to 3} \frac{f(x)}{g(x)}$. The limit does not exist.

Note: $\lim_{x \to 3^-} \frac{f(x)}{g(x)} = \infty$ since $g(x) \to 0^+$ as $x \to 3^-$ and $\lim_{x \to 3^+} \frac{f(x)}{g(x)} = -\infty$ since $g(x) \to 0^-$ as $x \to 3^+$. Therefore, the limit does not exist, even as an infinite limit.

(e) $\lim_{x \to 2} [x^2 f(x)] = \lim_{x \to 2} x^2 \cdot \lim_{x \to 2} f(x)$ [Limit Law 4]
$= 2^2 \cdot (-1)$
$= -4$

(f) $f(-1) + \lim_{x \to -1} g(x) = 3 + 2 = 5$

12.1/1 points | Previous AnswersSCalc8 1.6.006.

Evaluate the limit using the appropriate Limit Law(s). (If an answer does not exist, enter DNE.)

$$\lim_{u \to -2} \sqrt{u^4 + 5u + 10}$$

4 ✔ 4

Solution or Explanation

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13.1/1 points | Previous AnswersSCalc8 1.6.009.

Evaluate the limit using the appropriate Limit Law(s). (If an answer does not exist, enter DNE.)

$$\lim_{x \to 2} \sqrt{\frac{5x^2 + 5}{9x - 2}}$$

5/4 ✔ 5/4

Solution or Explanation

$$\lim_{x \to 2} \sqrt{\frac{5x^2 + 5}{9x - 2}} = \sqrt{\lim_{x \to 2} \frac{5x^2 + 5}{9x - 2}} \qquad \text{[Limit Law 11]}$$

$$= \sqrt{\frac{\lim_{x \to 2} (5x^2 + 5)}{\lim_{x \to 2} (9x - 2)}} \qquad [5]$$

$$= \sqrt{\frac{5 \lim_{x \to 2} x^2 + \lim_{x \to 2} 5}{9 \lim_{x \to 2} x - \lim_{x \to 2} 2}} \qquad \text{[1, 2, and 3]}$$

$$= \sqrt{\frac{5(2)^2 + 5}{9(2) - 2}} = \sqrt{\frac{25}{16}} = \frac{5}{4} \qquad \text{[9, 8, and 7]}$$

14.2/2 points | Previous AnswersSCalc8 1.6.011.

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

$$\lim_{x \to 5} \frac{x^2 - 9x + 20}{x - 5}$$

1 ✔ 1

Solution or Explanation

$$\lim_{x \to 5} \frac{x^2 - 9x + 20}{x - 5} = \lim_{x \to 5} \frac{(x - 5)(x - 4)}{x - 5} = \lim_{x \to 5} (x - 4) = 5 - 4 = 1$$

15.1/1 points | Previous AnswersSCalc8 1.6.017.

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

$$\lim_{h \to 0} \frac{(-6 + h)^2 - 36}{h}$$

-12 ✔ -12

Solution or Explanation

$$\lim_{h \to 0} \frac{(-6 + h)^2 - 36}{h} = \lim_{h \to 0} \frac{(36 - 12h + h^2) - 36}{h} = \lim_{h \to 0} \frac{-12h + h^2}{h} = \lim_{h \to 0} \frac{h(-12 + h)}{h} = \lim_{h \to 0} (-12 + h) = -12$$

16. 3/2 points | Previous Answers SCalc8 1.6.018.MI.

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

$$\lim_{h \to 0} \frac{(3 + h)^3 - 27}{h}$$

27 ✔ 27

Solution or Explanation

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17. 2/2 points | Previous Answers SCalc8 1.6.020.

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

$$\lim_{h \to 0} \frac{\sqrt{1 + h} - 1}{h}$$

1/2 ✔ 1/2

18. 2/2 points | Previous Answers SCalc8 1.6.021.

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

$$\lim_{h \to 0} \frac{\sqrt{36 + h} - 6}{h}$$

1/12 ✔ 1/12

Solution or Explanation

$$\lim_{h \to 0} \frac{\sqrt{36 + h} - 6}{h} = \lim_{h \to 0} \frac{\sqrt{36 + h} - 6}{h} \cdot \frac{\sqrt{36 + h} + 6}{\sqrt{36 + h} + 6} = \lim_{h \to 0} \frac{\left(\sqrt{36 + h}\right)^2 - 6^2}{h\left(\sqrt{36 + h} + 6\right)} = \lim_{h \to 0} \frac{(36 + h) - 36}{h\left(\sqrt{36 + h} + 6\right)}$$

$$= \lim_{h \to 0} \frac{h}{h\left(\sqrt{36 + h} + 6\right)} = \lim_{h \to 0} \frac{1}{\sqrt{36 + h} + 6} = \frac{1}{6 + 6} = \frac{1}{12}$$

19. 2/2 points | Previous Answers SCalc8 1.6.026.

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

$$\lim_{t \to 0} \left(\frac{9}{t} - \frac{9}{t^2 + t}\right)$$

9 ✔ 9

Solution or Explanation

Click to View Solution

20. 2/2 points | Previous Answers SCalc8 1.6.029.

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

$$\lim_{t \to 0} \left(\frac{1}{t\sqrt{1 + t}} - \frac{1}{t}\right)$$

-1/2 ✔ -1/2

Solution or Explanation

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21.1/1 points | Previous AnswersSCalc8 1.6.027.

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

$$\lim_{x \to 25} \frac{5 - \sqrt{x}}{25x - x^2}$$

1/250 ✓ 1/250

Solution or Explanation
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22.2/2 points | Previous AnswersSCalc8 1.6.042.MI.

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

$$\lim_{x \to -5} \frac{8x + 40}{|x + 5|}$$

$$DNE

✓ DNE

Solution or Explanation
Click to View Solution

23.2/2 points | Previous AnswersSCalc8 1.6.043.

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

$$\lim_{x \to 0.5^-} \frac{2x - 1}{|2x^3 - x^2|}$$

$$−4

✓ -4

Solution or Explanation
Click to View Solution

24.1/1 points | Previous AnswersSCalc8 1.6.044.

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

$$\lim_{x \to -4} \frac{4 - |x|}{4 + x}$$

$$1

✓ 1

Solution or Explanation
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25. 2/2 points | Previous Answers SCalc8 1.6.050.

Let

$$f(x) = \begin{cases} x^2 + 2 & \text{if } x < 1 \\ (x - 3)^2 & \text{if } x \geq 1 \end{cases}.$$

(a) Find the following limits. (If an answer does not exist, enter DNE.)

$\lim_{x \to 1^-} f(x) = \boxed{3}$ ✓ 3

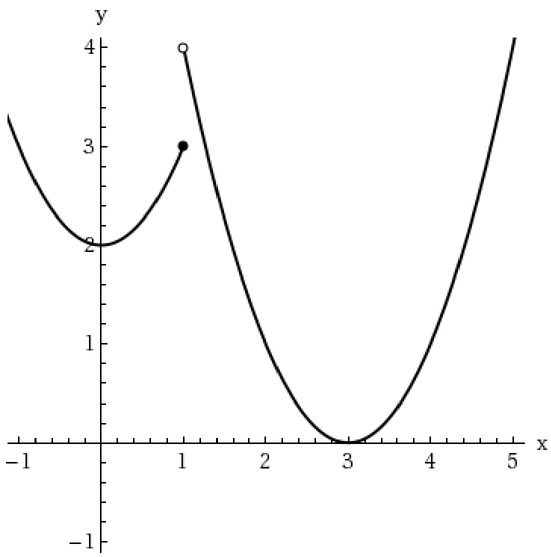
$\lim_{x \to 1^+} f(x) = \boxed{4}$ ✓ 4

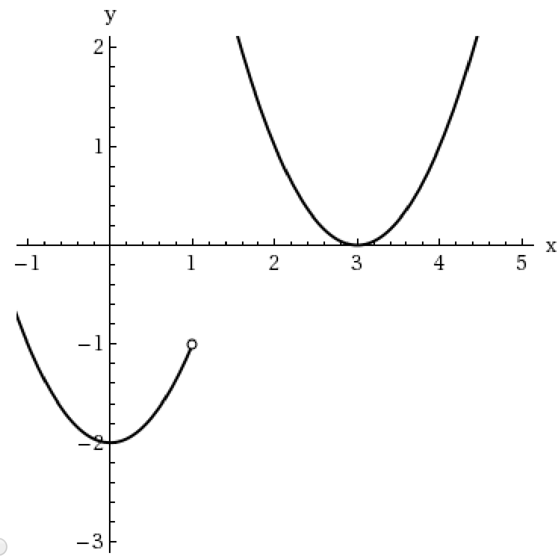
(b) Does $\lim_{x \to 1} f(x)$ exist?

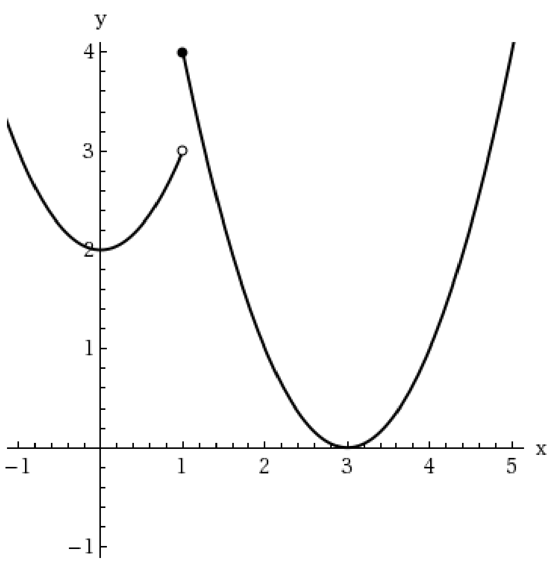
- ○ Yes
- ◉ No

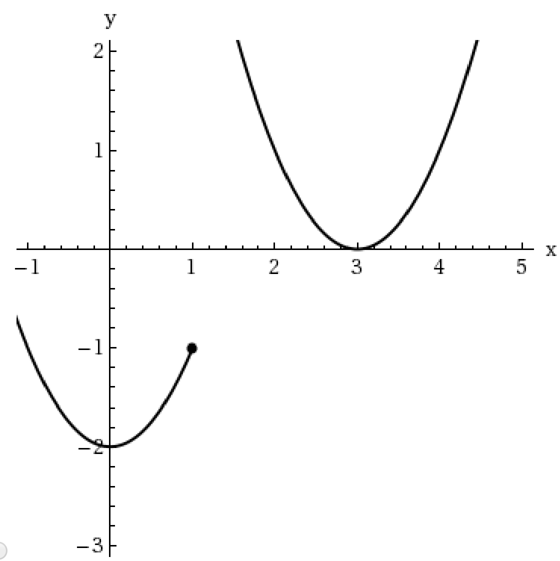
✓

(c) Sketch the graph of f.









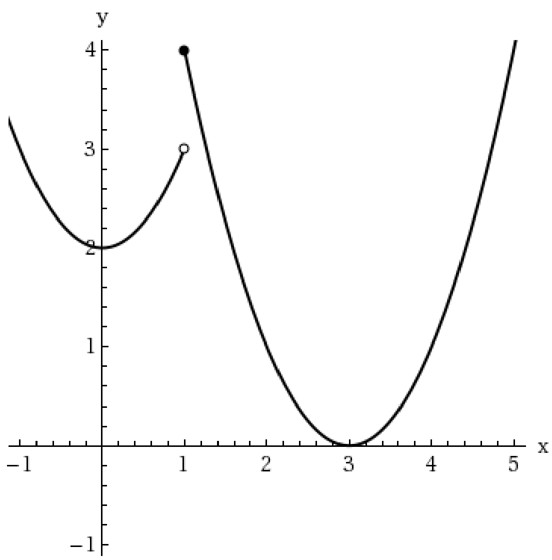
Solution or Explanation

(a) $f(x) = \begin{cases} x^2 + 2 & \text{if } x < 1 \\ (x-3)^2 & \text{if } x \geq 1 \end{cases}$

$\lim\limits_{x \to 1^-} f(x) = \lim\limits_{x \to 1^-} (x^2 + 2) = 1^2 + 2 = 3,\quad \lim\limits_{x \to 1^+} f(x) = \lim\limits_{x \to 1^+} (x-3)^2 = (-2)^2 = 4$

(b) Since the right-hand and left-hand limits of f at $x = 1$ are not equal, $\lim\limits_{x \to 1} f(x)$ does not exist.

(c)



26.3.5/3.5 points | Previous AnswersSCalc8 1.6.052.

Let

$$g(x) = \begin{cases} x & \text{if } x < 1 \\ 6 & \text{if } x = 1 \\ 2 - x^2 & \text{if } 1 < x \leq 2 \\ x - 3 & \text{if } x > 2 \end{cases}.$$

(a) Evaluate each of the following, if it exists. (If an answer does not exist, enter DNE.)

(i) $\lim_{x \to 1^-} g(x)$

1 ✔ 1

(ii) $\lim_{x \to 1^+} g(x)$

1 ✔ 1

(iii) $g(1)$

6 ✔ 6

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

-2 ✔ -2

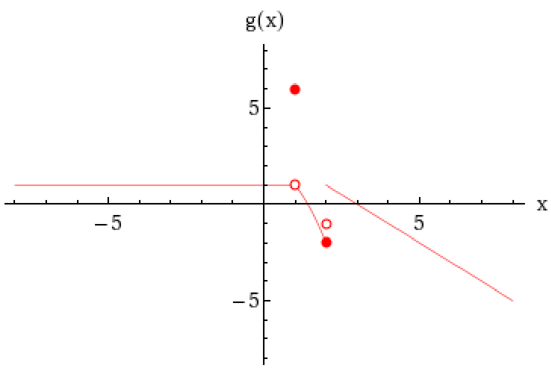
(v) $\lim_{x \to 2^+} g(x)$

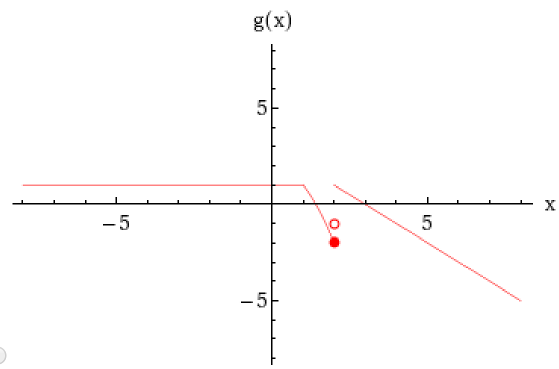
-1 ✔ -1

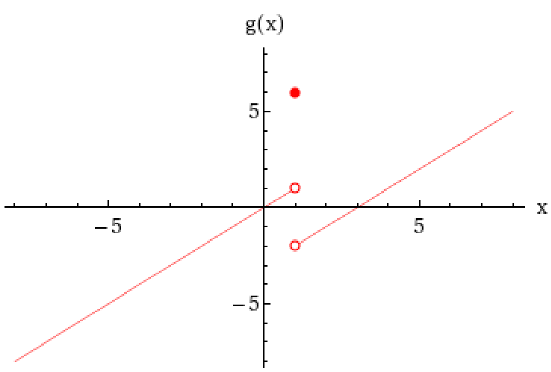
(vi) $\lim_{x \to 2} g(x)$

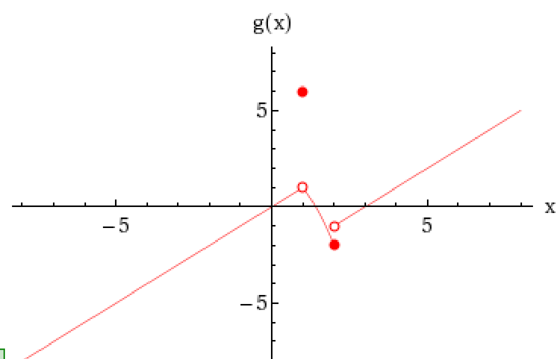
DNE ✔ DNE

(b) Sketch the graph of g.









✔

Solution or Explanation
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27. 1.5/1.5 points | Previous Answers SCalc8 1.6.059.

If $\lim_{x \to 1} \frac{f(x) - 2}{x - 1} = 7$, evaluate $\lim_{x \to 1} f(x)$.

2 ✓ 2

Solution or Explanation

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28. 2/0 points | Previous Answers SCalc8 1.6.030.

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

$$\lim_{x \to -12} \frac{\sqrt{x^2 + 25} - 13}{x + 12}$$

-12/13 ✓ -12/13

Solution or Explanation

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29. 2/0 points | Previous Answers SCalc8 1.6.031.

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

$$\lim_{h \to 0} \frac{(x + h)^3 - x^3}{h}$$

$$3x2

✓ $3x^2$

Solution or Explanation

$$\lim_{h \to 0} \frac{(x + h)^3 - x^3}{h} = \lim_{h \to 0} \frac{(x^3 + 3x^2h + 3xh^2 + h^3) - x^3}{h} = \lim_{h \to 0} \frac{3x^2h + 3xh^2 + h^3}{h}$$

$$= \lim_{h \to 0} \frac{h(3x^2 + 3xh + h^2)}{h} = \lim_{h \to 0} (3x^2 + 3xh + h^2) = 3x^2$$

30. 2/0 points | Previous Answers SCalc8 1.6.042.MI.SA.

This question has several parts that must be completed sequentially. If you skip a part of the question, you will not receive any points for the skipped part, and you will not be able to come back to the skipped part.

Tutorial Exercise

Find the limit, if it exists.

$$\lim_{x \to -8} \frac{9x + 72}{|x + 8|}$$

Step 1

Recall that

$$|x + 8| = \begin{cases} x + 8 & x \geq -8 \\ -(x + 8) & x < -8. \end{cases}$$

Therefore, we will need to check the limits when approaching from the left and from the right.

We will start by checking the limit when approaching from the left. As x approaches -8 from the left, we have

$$\lim_{x \to -8^-} \frac{9x + 72}{|x + 8|} = \lim_{x \to -8^-} \frac{9x + 72}{-(x+8)}.$$

$-(x+8)$

Step 2

Now, we factor and cancel common factors.

$$\lim_{x \to -8^-} \frac{9x + 72}{-(x + 8)} = \lim_{x \to -8^-} \frac{\boxed{9}\ \boxed{9}\,(x + 8)}{-(x + 8)}$$

$$= \lim_{x \to -8^-} \boxed{-9}\ \boxed{-9}$$

$$= \boxed{-9}\ \boxed{-9}$$

Step 3

Next, we check the limit when approaching from the right. As x approaches -8 from the right, we have

$$\lim_{x \to -8^+} \frac{9x + 72}{|x + 8|} = \lim_{x \to -8^+} \frac{9x + 72}{x+8}.$$

$x + 8$

Step 4

We now factor and cancel common factors.

$$\lim_{x \to -8^+} \frac{9x + 72}{x + 8} = \lim_{x \to -8^+} \frac{\boxed{9}\ \boxed{9}\,(x + 8)}{x + 8}$$

$$= \lim_{x \to -8^+} \boxed{9}\ \boxed{9}$$

$$= \boxed{9}\ \boxed{9}$$

Step 5

Since the left and right limits are different different, the limit is as follows. (If an answer does not exist, enter DNE.)

$$\lim_{x \to -8} \frac{9x + 72}{|x + 8|} =$$

DNE

DNE

You have now completed the Master It.

31. 2/0 points | Previous Answers SCalc8 1.6.064.

Evaluate $\lim_{x \to 4} \dfrac{\sqrt{8 - x} - 2}{\sqrt{13 - x} - 3}$.

3/2 ✔ 3/2

Solution or Explanation

Click to View Solution