This key should allow you to understand why you choose the option you did (beyond just getting a question right or wrong). More instructions on how to use this key can be found here.

If you have a suggestion to make the keys better, please fill out the short survey here.

Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

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1. Based on the information below, which of the following statements is always true?

$$f(x) \text{ approaches } 13.098 \text{ as } x \text{ approaches } \infty.$$

The solution is $f(x)$ is close to or exactly 13.098 when x is large enough., which is option D.

A. $f(x)$ is undefined when x is large enough.

B. x is undefined when $f(x)$ is large enough.

C. $f(x)$ is close to or exactly ∞ when x is large enough.

D. $f(x)$ is close to or exactly 13.098 when x is large enough.

E. None of the above are always true.

General Comment: The limit tells you what happens as the x-values approach ∞. It says **absolutely nothing** about what is happening exactly at $f(\infty)$!

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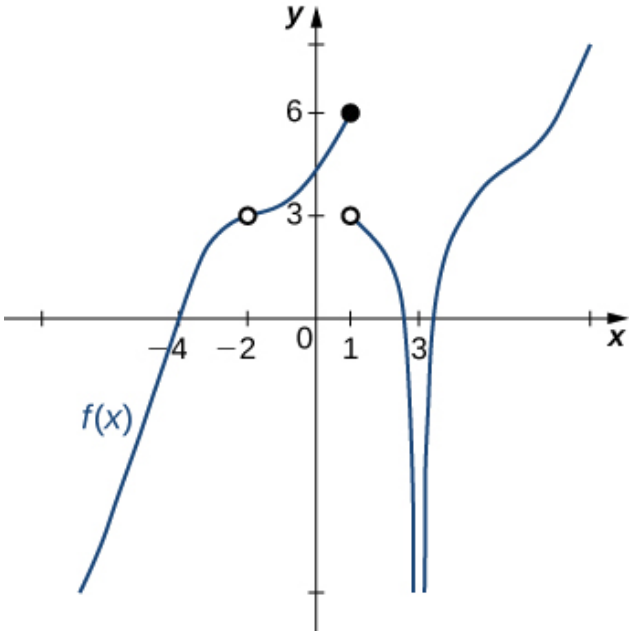
2. For the graph below, find the value(s) a that makes the statement true: $\lim_{x \to a} f(x)$ does not exist.



The solution is 1, which is option B.

A. 3

B. 1

C. -2

D. Multiple a make the statement true.

E. No a make the statement true.

General Comment: General Comments: Remember that the limit does not exist if the left-hand and right-hand limits do not match.

---

3. Evaluate the limit below, if possible.

$$\lim_{x \to 5} \frac{\sqrt{9x-9}-6}{7x-35}$$

The solution is None of the above, which is option E.

A. 0.083

You likely memorized how to solve the similar homework problem and used the same formula here.

B. ∞

You likely believed that since the denominator is equal to 0, the limit is infinity.

C. 0.429

You likely tried to use a shortcut to find the limit of a function that only works for when the numerator/denominator are polynomials.

D. 0.012

You likely learned L'Hospital's Rule in a previous course, but misapplied it here.

E. None of the above

* This is the correct option as the limit is 0.107.

General Comment: General comments: It is difficult to imagine the graph of this function, so you need to test values close to $x = 5$.

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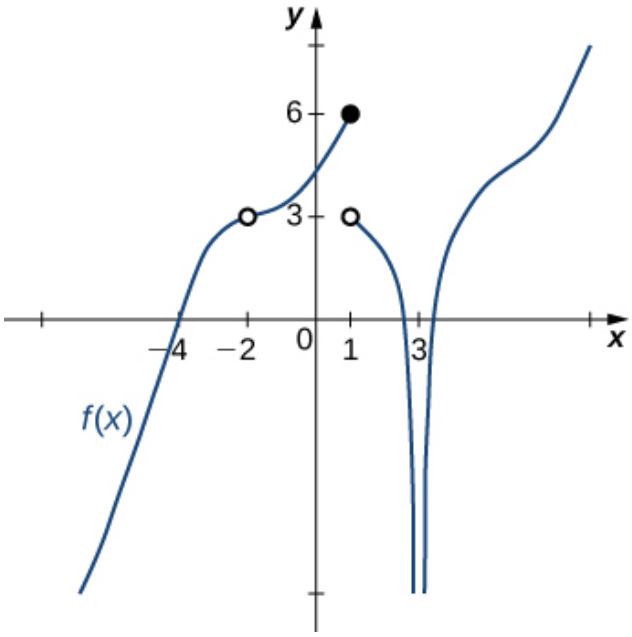
4. For the graph below, find the value(s) a that makes the statement true: $\lim_{x \to a} f(x) = 0$.



The solution is Multiple a make the statement true., which is option D.

A. 3

B. -4

C. 0

D. Multiple a make the statement true.

E. No a make the statement true.

General Comment: General Comments: There can be multiple a values that make the statement true! For the limit, draw a horizontal line and determine if an x value makes the limit exist.

---

5. Evaluate the one-sided limit of the function $f(x)$ below, if possible.

$$\lim_{x\to -6^-} \frac{9}{(x-6)^3} + 2$$

The solution is $f(-6)$, which is option B.

A. $-\infty$

B. $f(-6)$

C. ∞

D. The limit does not exist

E. None of the above

General Comment: General comments: You should be able to graph the rational function displayed. If not, go back to Module 7 to learn about the general shape of rational functions.

---

6. To estimate the one-sided limit of the function below as x approaches 8 from the right, which of the following sets of numbers should you use?

$$\frac{\frac{8}{x} - 1}{x - 8}$$

The solution is $\{8.1000, 8.0100, 8.0010, 8.0001\}$, which is option A.

A. $\{8.1000, 8.0100, 8.0010, 8.0001\}$

This is correct!

B. $\{7.9000, 7.9900, 8.0100, 8.1000\}$

These values would estimate the limit at the point and not a one-sided limit.

C. $\{8.0000, 8.1000, 8.0100, 8.0010\}$

If we get $\frac{0}{0}$ or $\frac{\infty}{\infty}$, the value 8 doesn't help us estimate the limit.

D. $\{7.9000, 7.9900, 7.9990, 7.9999\}$

These values would estimate the limit of 8 on the left.

E. $\{8.0000, 7.9000, 7.9900, 7.9990\}$

If we get $\frac{0}{0}$ or $\frac{\infty}{\infty}$, the value 8 doesn't help us estimate the limit.

General Comment: General Comments: To evaluate a one-sided limit, we want to put numbers close to the limit. We can't use the limit value itself if it results in $\frac{0}{0}$ or $\frac{\infty}{\infty}$

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7. Evaluate the one-sided limit of the function $f(x)$ below, if possible.

$$\lim_{x \to 4^-} \frac{-7}{(x-4)^4} + 5$$

The solution is $-\infty$, which is option C.

A. $f(4)$

B. ∞

C. $-\infty$

D. The limit does not exist

E. None of the above

General Comment: General comments: You should be able to graph the rational function displayed. If not, go back to Module 7 to learn about the general shape of rational functions.

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8. Based on the information below, which of the following statements is always true?

As x approaches 8, $f(x)$ approaches ∞.

The solution is $f(x)$ is undefined when x is close to or exactly 8., which is option C.

A. $f(x)$ is close to or exactly 8 when x is large enough.

B. $f(x)$ is close to or exactly ∞ when x is large enough.

C. $f(x)$ is undefined when x is close to or exactly 8.

D. x is undefined when $f(x)$ is close to or exactly ∞.

E. None of the above are always true.

General Comment: The limit tells you what happens as the x-values approach 8. It says **absolutely nothing** about what is happening exactly at $f(8)$!

---

9. To estimate the one-sided limit of the function below as x approaches 3 from the right, which of the following sets of numbers should you use?

$$\frac{\frac{3}{x}-1}{x-3}$$

The solution is $\{3.1000, 3.0100, 3.0010, 3.0001\}$, which is option C.

A. $\{2.9000, 2.9900, 3.0100, 3.1000\}$

These values would estimate the limit at the point and not a one-sided limit.

B. $\{3.0000, 2.9000, 2.9900, 2.9990\}$

If we get $\frac{0}{0}$ or $\frac{\infty}{\infty}$, the value 3 doesn't help us estimate the limit.

C. $\{3.1000, 3.0100, 3.0010, 3.0001\}$

This is correct!

D. $\{2.9000, 2.9900, 2.9990, 2.9999\}$

These values would estimate the limit of 3 on the left.

E. $\{3.0000, 3.1000, 3.0100, 3.0010\}$

If we get $\frac{0}{0}$ or $\frac{\infty}{\infty}$, the value 3 doesn't help us estimate the limit.

General Comment: General Comments: To evaluate a one-sided limit, we want to put numbers close to the limit. We can't use the limit value itself if it results in $\frac{0}{0}$ or $\frac{\infty}{\infty}$

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10. Evaluate the limit below, if possible.

$$\lim_{x\to 8}\frac{\sqrt{7x-40}-4}{9x-72}$$

The solution is 0.097, which is option D.

A. 0.125

You likely memorized how to solve the similar homework problem and used the same formula here.

B. ∞

You likely believed that since the denominator is equal to 0, the limit is infinity.

C. 0.294

You likely tried to use a shortcut to find the limit of a function that only works for when the numerator/denominator are polynomials.

D. 0.097

* This is the correct option.

E. None of the above

If you got a limit that does not match any of the above, please contact the coordinator.

General Comment: General comments: It is difficult to imagine the graph of this function, so you need to test values close to $x = 8$.