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.

1. To estimate the one-sided limit of the function below as x approaches 4 from the left, which of the following sets of numbers should you use?
$$\frac{\frac{4}{x} - 1}{x - 4}$$

   The solution is $\{3.9000, 3.9900, 3.9990, 3.9999\}$, which is option A.

   A. $\{3.9000, 3.9900, 3.9990, 3.9999\}$

      This is correct!

   B. $\{4.0000, 4.1000, 4.0100, 4.0010\}$

      If we get $\frac{0}{0}$ or $\frac{\infty}{\infty}$, the value 4 doesn't help us estimate the limit.

   C. $\{4.1000, 4.0100, 4.0010, 4.0001\}$

      These values would estimate the limit of 4 on the right.

   D. $\{4.0000, 3.9000, 3.9900, 3.9990\}$

      If we get $\frac{0}{0}$ or $\frac{\infty}{\infty}$, the value 4 doesn't help us estimate the limit.

   E. $\{3.9000, 3.9900, 4.0100, 4.1000\}$

      These values would estimate the limit at the point and not a one-sided 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 $\frac{\infty}{\infty}$

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

$$\lim_{x \to 6^+} \frac{6}{(x-6)^6} + 5$$

   The solution is ∞, which is option A.

   A. ∞

   B. $f(6)$

   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.

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

$$\lim_{x \to -5^-} \frac{6}{(x-5)^9} + 4$$

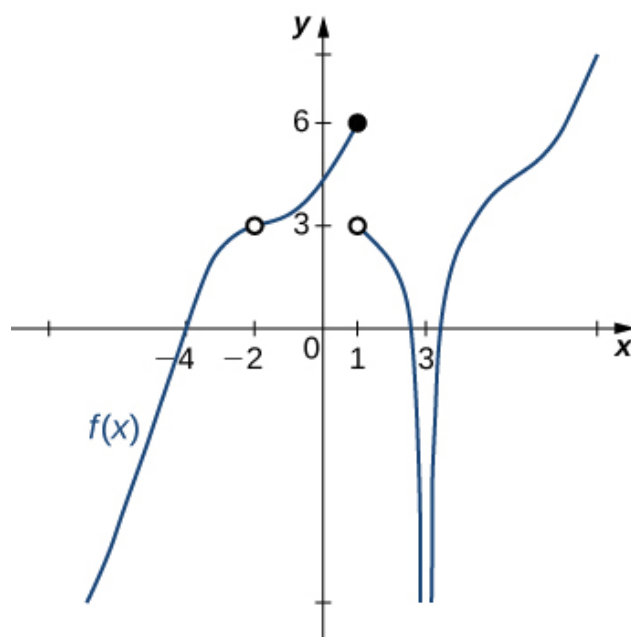The solution is $f(-5)$, which is option A.

A. $f(-5)$

B. $-\infty$

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.

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

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

A. -2

B. $-\infty$

C. 3

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 limit below, if possible.

$$\lim_{x \to 9} \frac{\sqrt{5x - 20} - 5}{9x - 81}$$

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

A. 0.011

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

B. 0.100

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

C. ∞

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

D. 0.248

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

E. None of the above

* This is the correct option as the limit is 0.056.

General Comment: General comments: It is difficult to imagine the graph of this function, so you need to test values close to $x = 9$.

6. Evaluate the limit below, if possible.

$$\lim_{x \to 6} \frac{\sqrt{8x - 23} - 5}{3x - 18}$$

The solution is 0.267, which is option B.

A. 0.943

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

B. 0.267

* This is the correct option.

C. 0.100

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

D. ∞

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

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 $x = 6$.

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

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

The solution is $\{7.9000, 7.9900, 7.9990, 7.9999\}$, which is option E.

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

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

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

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

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

   These values would estimate the limit at the point and not a one-sided limit.
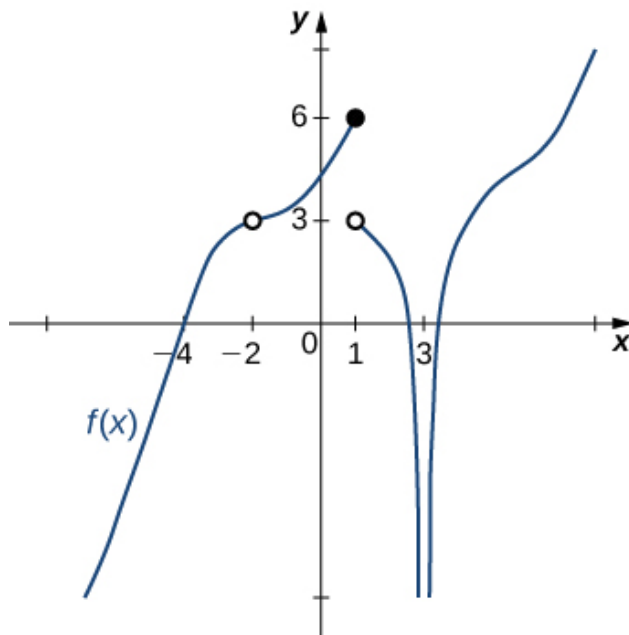
D. $\{8.0000, 8.1000, 8.0100, 8.0010\}$

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

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

   This is correct!

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 $\frac{\infty}{\infty}$

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

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

A. 3

B. 0

C. -4

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.

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

$$f(x) \ approaches \ 17.121 \ as \ x \ approaches \ 7.$$

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

A. $f(17) = 7$

B. $f(7) = 17$

C. $f(7)$ is close to or exactly 17

D. $f(17)$ is close to or exactly 7

E. None of the above are always true.

General Comment: The limit tells you what happens as the x-values approach 7. It says **absolutely nothing** about what is happening exactly at $f(7)$!

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

$$f(x) \ approaches \ 3.475 \ as \ x \ approaches \ 9.$$

The solution is $f(x)$ is close to or exactly 3.475 when x is close to 9, which is option A.

A. $f(x)$ is close to or exactly 3.475 when x is close to 9

B. $f(x) = 3.475$ when x is close to 9

C. $f(x)$ is close to or exactly 9 when x is close to 3.475

D. $f(x) = 9$ when x is close to 3.475

E. None of the above are always true.

General Comment: The limit tells you what happens as the x-values approach 9. It says **absolutely nothing** about what is happening exactly at $f(9)$!