

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.

- Find the inverse of the function below (if it exists). Then, evaluate the inverse at $x = -14$ and choose the interval the $f^{-1}(-14)$ belongs to.

$$f(x) = \sqrt[3]{5x - 4}$$

The solution is -548.0 , which is option C.

A. $f^{-1}(-14) \in [549.35, 550.03]$

This solution corresponds to distractor 3.

B. $f^{-1}(-14) \in [547.73, 548.1]$

This solution corresponds to distractor 2.

C. $f^{-1}(-14) \in [-548.94, -547.75]$

* This is the correct solution.

D. $f^{-1}(-14) \in [-549.82, -549.15]$

Distractor 1: This corresponds to

E. The function is not invertible for all Real numbers.

This solution corresponds to distractor 4.

General Comment: Be sure you check that the function is 1-1 before trying to find the inverse!

- Choose the interval below that f composed with g at $x = -1$ is in.

$$f(x) = -2x^3 + x^2 + x - 2 \text{ and } g(x) = 2x^3 - 2x^2 - x$$

The solution is 58.0 , which is option D.

A. $(f \circ g)(-1) \in [62, 67]$

Distractor 2: Corresponds to being slightly off from the solution.

B. $(f \circ g)(-1) \in [-2, 2]$

Distractor 1: Corresponds to reversing the composition.

C. $(f \circ g)(-1) \in [6, 18]$

Distractor 3: Corresponds to being slightly off from the solution.

D. $(f \circ g)(-1) \in [56, 59]$

* This is the correct solution

E. It is not possible to compose the two functions.

General Comment: f composed with g at x means $f(g(x))$. The order matters!

3. Find the inverse of the function below. Then, evaluate the inverse at $x = 8$ and choose the interval that $f^{-1}(8)$ belongs to.

$$f(x) = e^{x+2} + 3$$

The solution is $f^{-1}(8) = -0.391$, which is option C.

A. $f^{-1}(8) \in [4.74, 4.85]$

This solution corresponds to distractor 3.

B. $f^{-1}(8) \in [5.36, 5.45]$

This solution corresponds to distractor 2.

C. $f^{-1}(8) \in [-0.49, -0.34]$

This is the solution.

D. $f^{-1}(8) \in [5.3, 5.38]$

This solution corresponds to distractor 4.

E. $f^{-1}(8) \in [3.59, 3.66]$

This solution corresponds to distractor 1.

General Comment: Natural log and exponential functions always have an inverse. Once you switch the x and y , use the conversion $e^y = x \leftrightarrow y = \ln(x)$.

4. Determine whether the function below is 1-1.

$$f(x) = 25x^2 - 130x + 169$$

The solution is no, which is option B.

A. Yes, the function is 1-1.

Corresponds to believing the function passes the Horizontal Line test.

B. No, because there is a y -value that goes to 2 different x -values.

* This is the solution.

C. No, because there is an x -value that goes to 2 different y -values.

Corresponds to the Vertical Line test, which checks if an expression is a function.

D. No, because the range of the function is not $(-\infty, \infty)$.

Corresponds to believing 1-1 means the range is all Real numbers.

E. No, because the domain of the function is not $(-\infty, \infty)$.

Corresponds to believing 1-1 means the domain is all Real numbers.

General Comment: There are only two valid options: The function is 1-1 OR No because there is a y -value that goes to 2 different x -values.

5. Determine whether the function below is 1-1.

$$f(x) = 25x^2 + 110x + 121$$

The solution is no, which is option B.

- A. No, because the domain of the function is not $(-\infty, \infty)$.

Corresponds to believing 1-1 means the domain is all Real numbers.

- B. No, because there is a y -value that goes to 2 different x -values.

* This is the solution.

- C. Yes, the function is 1-1.

Corresponds to believing the function passes the Horizontal Line test.

- D. No, because the range of the function is not $(-\infty, \infty)$.

Corresponds to believing 1-1 means the range is all Real numbers.

- E. No, because there is an x -value that goes to 2 different y -values.

Corresponds to the Vertical Line test, which checks if an expression is a function.

General Comment: There are only two valid options: The function is 1-1 OR No because there is a y -value that goes to 2 different x -values.

6. Choose the interval below that f composed with g at $x = 1$ is in.

$$f(x) = -2x^3 + 3x^2 + 3x - 2 \text{ and } g(x) = 2x^3 - 3x^2 - 2x$$

The solution is 70.0, which is option A.

- A. $(f \circ g)(1) \in [68, 73]$

* This is the correct solution

- B. $(f \circ g)(1) \in [62, 66]$

Distractor 2: Corresponds to being slightly off from the solution.

- C. $(f \circ g)(1) \in [5, 12]$

Distractor 3: Corresponds to being slightly off from the solution.

- D. $(f \circ g)(1) \in [-1, 2]$

Distractor 1: Corresponds to reversing the composition.

- E. It is not possible to compose the two functions.

General Comment: f composed with g at x means $f(g(x))$. The order matters!

7. Find the inverse of the function below (if it exists). Then, evaluate the inverse at $x = 15$ and choose the interval that $f^{-1}(15)$ belongs to.

$$f(x) = 4x^2 + 2$$

The solution is The function is not invertible for all Real numbers. , which is option E.

- A. $f^{-1}(15) \in [3.75, 3.82]$

Distractor 4: This corresponds to both distractors 2 and 3.

- B. $f^{-1}(15) \in [1.72, 1.95]$

Distractor 1: This corresponds to trying to find the inverse even though the function is not 1-1.

C. $f^{-1}(15) \in [1.89, 2.4]$

Distractor 2: This corresponds to finding the (nonexistent) inverse and not subtracting by the vertical shift.

D. $f^{-1}(15) \in [2.7, 2.87]$

Distractor 3: This corresponds to finding the (nonexistent) inverse and dividing by a negative.

E. The function is not invertible for all Real numbers.

* This is the correct option.

General Comment: Be sure you check that the function is 1-1 before trying to find the inverse!

8. Find the inverse of the function below. Then, evaluate the inverse at $x = 8$ and choose the interval that $f^{-1}(8)$ belongs to.

$$f(x) = e^{x+4} + 5$$

The solution is $f^{-1}(8) = -2.901$, which is option A.

A. $f^{-1}(8) \in [-2.97, -2.87]$

This is the solution.

B. $f^{-1}(8) \in [6.35, 6.44]$

This solution corresponds to distractor 3.

C. $f^{-1}(8) \in [7.52, 7.57]$

This solution corresponds to distractor 2.

D. $f^{-1}(8) \in [7.46, 7.51]$

This solution corresponds to distractor 4.

E. $f^{-1}(8) \in [5.03, 5.16]$

This solution corresponds to distractor 1.

General Comment: Natural log and exponential functions always have an inverse. Once you switch the x and y , use the conversion $e^y = x \leftrightarrow y = \ln(x)$.

9. Add the following functions, then choose the domain of the resulting function from the list below.

$$f(x) = \sqrt{5x - 16} \text{ and } g(x) = 5x^3 + 4x^2 + 5x + 1$$

The solution is The domain is all Real numbers greater than or equal to $x = 3.2$, which is option C.

A. The domain is all Real numbers except $x = a$, where $a \in [-8.75, -0.75]$

B. The domain is all Real numbers less than or equal to $x = a$, where $a \in [-11, -2]$

C. The domain is all Real numbers greater than or equal to $x = a$, where $a \in [0.2, 5.2]$

D. The domain is all Real numbers except $x = a$ and $x = b$, where $a \in [-9.67, -1.67]$ and $b \in [-4.67, -2.67]$

E. The domain is all Real numbers.

General Comment: The new domain is the intersection of the previous domains.

10. Multiply the following functions, then choose the domain of the resulting function from the list below.

$$f(x) = \frac{1}{5x - 21} \text{ and } g(x) = \frac{1}{5x - 21}$$

The solution is The domain is all Real numbers except $x = 4.2$ and $x = 4.2$, which is option D.

- A. The domain is all Real numbers less than or equal to $x = a$, where $a \in [-4.25, -1.25]$
- B. The domain is all Real numbers greater than or equal to $x = a$, where $a \in [-10.25, -2.25]$
- C. The domain is all Real numbers except $x = a$, where $a \in [-9.6, -4.6]$
- D. The domain is all Real numbers except $x = a$ and $x = b$, where $a \in [3.2, 6.2]$ and $b \in [-0.8, 7.2]$
- E. The domain is all Real numbers.

General Comment: The new domain is the intersection of the previous domains.
