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. Find the inverse of the function below (if it exists). Then, evaluate the inverse at $x = 12$ and choose the interval that $f^{-1}(12)$ belongs to.

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

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

A. $f^{-1}(12) \in [5.84, 6.11]$

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

B. $f^{-1}(12) \in [3.55, 4.56]$

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

C. $f^{-1}(12) \in [0.95, 1.74]$

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

D. $f^{-1}(12) \in [1.66, 2.33]$

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

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!

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

$$f(x) = (4x - 19)^3$$

The solution is yes, which is option D.

A. 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.

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

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

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

Corresponds to the Horizontal Line test, which this function passes.

D. Yes, the function is 1-1.

* This is the solution.

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.

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

$$f(x) = 25x^2 - 140x + 196$$

The solution is no, which is option A.

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

   * This is the solution.

B. Yes, the function is 1-1.

   Corresponds to believing the function passes the Horizontal Line test.

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 domain of the function is not $(-\infty, \infty)$.

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

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

   Corresponds to believing 1-1 means the range 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.

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4. 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. $f^{-1}(8) \in [-3.12, -2.79]$

   This is the solution.

B. $f^{-1}(8) \in [5.55, 6.77]$

   This solution corresponds to distractor 3.

C. $f^{-1}(8) \in [7.54, 8.2]$

   This solution corresponds to distractor 2.

D. $f^{-1}(8) \in [7.33, 7.56]$

   This solution corresponds to distractor 4.

E. $f^{-1}(8) \in [4.91, 5.36]$

   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 $e^y = x \leftrightarrow y = \ln(x)$.

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

$$f(x) = \frac{2}{5x-28} \text{ and } g(x) = 7x+2$$

The solution is The domain is all Real numbers except $x = 5.6$, which is option C.

A. The domain is all Real numbers greater than or equal to $x = a$, where $a \in [-11.33, -5.33]$

B. The domain is all Real numbers less than or equal to $x = a$, where $a \in [4, 6]$

C. The domain is all Real numbers except $x = a$, where $a \in [4.6, 8.6]$

D. The domain is all Real numbers except $x = a$ and $x = b$, where $a \in [-5.25, -2.25]$ and $b \in [-6.2, -4.2]$

E. The domain is all Real numbers.

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

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6. 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.

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

The solution is 684.75, which is option A.

A. $f^{-1}(14) \in [683.2, 686]$

* This is the correct solution.

B. $f^{-1}(14) \in [-687.4, -687.2]$

This solution corresponds to distractor 3.

C. $f^{-1}(14) \in [686.5, 689.8]$

Distractor 1: This corresponds to

D. $f^{-1}(14) \in [-685.1, -684]$

This solution corresponds to distractor 2.

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!

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

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

The solution is 0.0, which is option D.

A. $(f \circ g)(1) \in [8.7, 9.1]$

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

B. $(f \circ g)(1) \in [0.8, 3.5]$

Distractor 1: Corresponds to reversing the composition.

C. $(f \circ g)(1) \in [9.3, 12.7]$

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

D. $(f \circ g)(1) \in [-1.7, 1.2]$

* 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!

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

$$f(x) = \frac{3}{3x - 17} \text{ and } g(x) = \frac{5}{4x + 21}$$

The solution is The domain is all Real numbers except $x = 5.666666666666667$ and $x = -5.25$, which is option D.

A. The domain is all Real numbers less than or equal to $x = a$, where $a \in [0, 8]$

B. The domain is all Real numbers except $x = a$, where $a \in [2.67, 6.67]$

C. The domain is all Real numbers greater than or equal to $x = a$, where $a \in [-10.6, 0.4]$

D. The domain is all Real numbers except $x = a$ and $x = b$, where $a \in [3.67, 12.67]$ and $b \in [-9.25, -4.25]$

E. The domain is all Real numbers.

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

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

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

The solution is 2.0, which is option B.

A. $(f \circ g)(-1) \in [-33, -27]$

Distractor 1: Corresponds to reversing the composition.

B. $(f \circ g)(-1) \in [-1, 7]$

* This is the correct solution

C. $(f \circ g)(-1) \in [-27, -21]$

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

D. $(f \circ g)(-1) \in [-10, -1]$

Distractor 2: Corresponds to being slightly off from the 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!

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

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

The solution is $f^{-1}(8) = 4.792$, which is option E.

A. $f^{-1}(8) \in [3.55, 3.72]$

This solution corresponds to distractor 4.

B. $f^{-1}(8) \in [-1.23, -1.09]$

This solution corresponds to distractor 1.

C. $f^{-1}(8) \in [4.21, 4.33]$

This solution corresponds to distractor 2.

D. $f^{-1}(8) \in [4.37, 4.44]$

This solution corresponds to distractor 3.

E. $f^{-1}(8) \in [4.76, 4.8]$

This is the solution.

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