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 $x = 11$ and choose the interval that $f^{-1}(11)$ belongs to.

$$f(x) = 3x^2 - 2$$

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

A. $f^{-1}(11) \in [1.93, 2.58]$

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

B. $f^{-1}(11) \in [4.79, 5.22]$

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

C. $f^{-1}(11) \in [1.54, 2]$

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

D. $f^{-1}(11) \in [3.84, 4.62]$

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!

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

$$f(x) = 15x^2 - 8x - 384$$

The solution is no, which is option C.

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. Yes, the function is 1-1.

Corresponds to believing the function passes the Horizontal Line test.

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

* This is the solution.

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.

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

$$f(x) = -12x^2 - 44x + 240$$

The solution is no, which is option E.

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

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

B. 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.

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

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

D. Yes, the function is 1-1.

Corresponds to believing the function passes the Horizontal Line test.

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

* This is the solution.

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 $x = 6$ and choose the interval that $f^{-1}(6)$ belongs to.

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

The solution is $f^{-1}(6) = 4.386$, which is option A.

A. $f^{-1}(6) \in [4.3, 4.46]$

This is the solution.

B. $f^{-1}(6) \in [3.85, 4.09]$

This solution corresponds to distractor 2.

C. $f^{-1}(6) \in [3.08, 3.25]$

This solution corresponds to distractor 4.

D. $f^{-1}(6) \in [-1.74, -1.49]$

This solution corresponds to distractor 1.

E. $f^{-1}(6) \in [4.15, 4.29]$

This solution corresponds to distractor 3.

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

$$f(x) = 3x + 3 \text{ and } g(x) = 2x^3 + x^2 + 7x + 5$$

The solution is $(-\infty, \infty)$, which is option E.

A. The domain is all Real numbers except $x = a,$ where $a \in [2.25, 10.25]$

B. The domain is all Real numbers less than or equal to $x = a,$ where $a \in [-1.75, 6.25]$

C. The domain is all Real numbers greater than or equal to $x = a,$ where $a \in [4.2, 5.2]$

D. The domain is all Real numbers except $x = a$ and $x = b,$ where $a \in [-7.67, -0.67]$ and $b \in [-7.75, -0.75]$

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 $x = 10$ and choose the interval that $f^{-1}(10)$ belongs to.

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

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

A. $f^{-1}(10) \in [0.99, 2.48]$

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

B. $f^{-1}(10) \in [1.92, 3.54]$

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

C. $f^{-1}(10) \in [4.5, 5.73]$

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

D. $f^{-1}(10) \in [3.37, 3.66]$

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!

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

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

The solution is 0.0, which is option D.

A. $(f \circ g)(-1) \in [-8, -5]$

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

B. $(f \circ g)(-1) \in [38, 47]$

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

C. $(f \circ g)(-1) \in [36, 41]$

Distractor 1: Corresponds to reversing the composition.

D. $(f \circ g)(-1) \in [-3, 1]$

* 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.

$$f(x) = \sqrt{-4x + 18} \text{ and } g(x) = 4x^3 + 7x^2 + 5x + 3$$

The solution is The domain is all Real numbers less than or equal to$x = 4.5$., which is option B.

A. The domain is all Real numbers greater than or equal to $x = a,$ where $a \in [1.33, 7.33]$

B. The domain is all Real numbers less than or equal to $x = a,$ where $a \in [-1.5, 5.5]$

C. The domain is all Real numbers except $x = a,$ where $a \in [-10.33, 1.67]$

D. The domain is all Real numbers except $x = a$ and $x = b,$ where $a \in [1.4, 6.4]$ and $b \in [-8.25, -5.25]$

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.

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

The solution is -9.0, which is option B.

A. $(f \circ g)(1) \in [-46, -40]$

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

B. $(f \circ g)(1) \in [-11, -8]$

* This is the correct solution

C. $(f \circ g)(1) \in [-23, -14]$

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

D. $(f \circ g)(1) \in [-53, -49]$

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!

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10. Find the inverse of the function below. Then, evaluate the inverse at $x = 9$ and choose the interval that $f^{-1}(9)$ belongs to.

$$f(x) = \ln(x + 2) - 4$$

The solution is $f^{-1}(9) = 442411.392$, which is option A.

A. $f^{-1}(9) \in [442403.39, 442415.39]$

This is the solution.

B. $f^{-1}(9) \in [1088.63, 1094.63]$

This solution corresponds to distractor 2.

C. $f^{-1}(9) \in [442412.39, 442419.39]$

This solution corresponds to distractor 3.

D. $f^{-1}(9) \in [59868.14, 59871.14]$

This solution corresponds to distractor 4.

E. $f^{-1}(9) \in [140.41, 147.41]$

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