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

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

The solution is 78.0, which is option B.

A. $(f \circ g)(-1) \in [-11, -5]$

Distractor 1: Corresponds to reversing the composition.

B. $(f \circ g)(-1) \in [75, 79]$

* This is the correct solution

C. $(f \circ g)(-1) \in [81, 90]$

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

D. $(f \circ g)(-1) \in [-5, 0]$

Distractor 3: 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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2. Find the inverse of the function below (if it exists). Then, evaluate the inverse at $x = -15$ and choose the interval the $f^{-1}(-15)$ belongs to.

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

The solution is -1126.6666666666667, which is option A.

A. $f^{-1}(-15) \in [-1128.5, -1124.9]$

* This is the correct solution.

B. $f^{-1}(-15) \in [-1124.7, -1122.4]$

Distractor 1: This corresponds to

C. $f^{-1}(-15) \in [1122.2, 1125.6]$

This solution corresponds to distractor 3.

D. $f^{-1}(-15) \in [1124.6, 1127.9]$

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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3. 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.

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

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

A. $f^{-1}(-10) \in [1.58, 2.34]$

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

B. $f^{-1}(-10) \in [2.26, 2.49]$

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

C. $f^{-1}(-10) \in [4.29, 5.04]$

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

D. $f^{-1}(-10) \in [1.22, 1.62]$

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

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

The solution is -3.0, which is option C.

A. $(f \circ g)(-1) \in [9, 20]$

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

B. $(f \circ g)(-1) \in [-15, -9]$

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

C. $(f \circ g)(-1) \in [-4, 0]$

* This is the correct solution

D. $(f \circ g)(-1) \in [4, 9]$

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

$$f(x) = -24x^2 - 270x - 729$$

The solution is no, which is option E.

A. Yes, the function is 1-1.

Corresponds to believing the function passes the Horizontal Line test.

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

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

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 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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6. Find the inverse of the function below. Then, evaluate the inverse at $x = 5$ and choose the interval that $f^{-1}(5)$ belongs to.

$$f(x) = \ln(x + 3) - 2$$

The solution is $f^{-1}(5) = 1093.633$, which is option A.

A. $f^{-1}(5) \in [1090.63, 1097.63]$

This is the solution.

B. $f^{-1}(5) \in [3.39, 6.39]$

This solution corresponds to distractor 2.

C. $f^{-1}(5) \in [1097.63, 1106.63]$

This solution corresponds to distractor 3.

D. $f^{-1}(5) \in [2977.96, 2983.96]$

This solution corresponds to distractor 4.

E. $f^{-1}(5) \in [15.09, 18.09]$

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

$$f(x) = \ln(x - 4) - 5$$

The solution is $f^{-1}(9) = 1202608.284$, which is option B.

A. $f^{-1}(9) \in [1202596.28, 1202605.28]$

This solution corresponds to distractor 3.

B. $f^{-1}(9) \in [1202604.28, 1202609.28]$

This is the solution.

C. $f^{-1}(9) \in [141.41, 144.41]$

This solution corresponds to distractor 4.

D. $f^{-1}(9) \in [442408.39, 442416.39]$

This solution corresponds to distractor 2.

E. $f^{-1}(9) \in [55.6, 61.6]$

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

$$f(x) = 8x^2 + 5x + 5 \text{ and } g(x) = 3x + 6$$

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

A. The domain is all Real numbers greater than or equal to $x = a,$ where $a \in [-8, -2]$

B. The domain is all Real numbers less than or equal to $x = a,$ where $a \in [2.33, 3.33]$

C. The domain is all Real numbers except $x = a,$ where $a \in [1.75, 6.75]$

D. The domain is all Real numbers except $x = a$ and $x = b,$ where $a \in [4.2, 10.2]$ and $b \in [-7.17, -4.17]$

E. The domain is all Real numbers.

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

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

$$f(x) = (5x - 23)^3$$

The solution is yes, which is option A.

A. Yes, the function is 1-1.

* This is the solution.

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 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 there is a y-value that goes to 2 different x-values.

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

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

$$f(x) = x + 3 \text{ and } g(x) = 6x + 7$$

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

A. The domain is all Real numbers greater than or equal to $x = a,$ where $a \in [-10, -5]$

B. The domain is all Real numbers except $x = a,$ where $a \in [-5.67, -2.67]$

C. The domain is all Real numbers less than or equal to $x = a,$ where $a \in [-5.33, -0.33]$

D. The domain is all Real numbers except $x = a$ and $x = b,$ where $a \in [4.6, 11.6]$ and $b \in [6.2, 11.2]$

E. The domain is all Real numbers.

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