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 $x = 13$ and choose the interval the $f^{-1}(13)$ belongs to.

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

The solution is 440.2, which is option B.

A. $f^{-1}(13) \in [-439.6, -437.3]$

This solution corresponds to distractor 3.

B. $f^{-1}(13) \in [440, 441]$

* This is the correct solution.

C. $f^{-1}(13) \in [-442.7, -439]$

This solution corresponds to distractor 2.

D. $f^{-1}(13) \in [435.5, 439]$

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!

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

$$f(x) = \frac{2}{5x + 34} \text{ and } g(x) = x^4 + 4x^3 + x^2 + 7x$$

The solution is The domain is all Real numbers except $x = -6.8$, which is option B.

A. The domain is all Real numbers greater than or equal to $x = a$, where $a \in [-6.5, 7.5]$

B. The domain is all Real numbers except $x = a$, where $a \in [-6.8, -2.8]$

C. The domain is all Real numbers less than or equal to $x = a$, where $a \in [2.2, 7.2]$

D. The domain is all Real numbers except $x = a$ and $x = b$, where $a \in [1.75, 4.75]$ and $b \in [-5.67, -1.67]$

E. The domain is all Real numbers.

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

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

$$f(x) = \sqrt{-6x - 18} \text{ and } g(x) = 4x^2 + 2x + 4$$

The solution is The domain is all Real numbers less than or equal to$x = -3.0$., which is option B.

A. The domain is all Real numbers except $x = a,$ where $a \in [-7.67, -3.67]$

B. The domain is all Real numbers less than or equal to $x = a,$ where $a \in [-4, -1]$

C. The domain is all Real numbers greater than or equal to $x = a,$ where $a \in [-7.4, -2.4]$

D. The domain is all Real numbers except $x = a$ and $x = b,$ where $a \in [-6.2, -1.2]$ and $b \in [-8.17, -1.17]$

E. The domain is all Real numbers.

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

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

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

The solution is 28.0, which is option B.

A. $(f \circ g)(1) \in [14, 20]$

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

B. $(f \circ g)(1) \in [28, 31]$

* This is the correct solution

C. $(f \circ g)(1) \in [47, 52]$

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

D. $(f \circ g)(1) \in [37, 46]$

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

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

The solution is 0.0, which is option B.

A. $(f \circ g)(-1) \in [56, 65]$

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

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

* This is the correct solution

C. $(f \circ g)(-1) \in [6, 14]$

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

D. $(f \circ g)(-1) \in [64, 69]$

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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6. 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.

$$f(x) = 5x^2 - 3$$

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

A. $f^{-1}(-11) \in [0.99, 1.41]$

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

B. $f^{-1}(-11) \in [2.23, 2.55]$

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

C. $f^{-1}(-11) \in [1.51, 1.87]$

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

D. $f^{-1}(-11) \in [5.15, 5.38]$

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

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. Determine whether the function below is 1-1.

$$f(x) = 16x^2 + 32x - 425$$

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

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

C. Yes, the function is 1-1.

Corresponds to believing the function passes the Horizontal Line test.

D. 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.

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

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

The solution is $f^{-1}(6) = 50.598$, which is option D.

A. $f^{-1}(6) \in [53.6, 65.6]$

This solution corresponds to distractor 3.

B. $f^{-1}(6) \in [22024.47, 22031.47]$

This solution corresponds to distractor 4.

C. $f^{-1}(6) \in [7.39, 12.39]$

This solution corresponds to distractor 2.

D. $f^{-1}(6) \in [49.6, 54.6]$

This is the solution.

E. $f^{-1}(6) \in [2974.96, 2983.96]$

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

$$f(x) = 25x^2 - 250x + 625$$

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

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

D. 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.

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

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

The solution is $f^{-1}(7) = 8105.084$, which is option C.

A. $f^{-1}(7) \in [148.41, 155.41]$

This solution corresponds to distractor 1.

B. $f^{-1}(7) \in [8099.08, 8103.08]$

This solution corresponds to distractor 3.

C. $f^{-1}(7) \in [8102.08, 8107.08]$

This is the solution.

D. $f^{-1}(7) \in [146.41, 148.41]$

This solution corresponds to distractor 4.

E. $f^{-1}(7) \in [8099.08, 8103.08]$

This solution corresponds to distractor 2.

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