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

$$f(x) = \sqrt{-5x + 18} \text{ and } g(x) = 8x^4 + 5x^3 + 3x^2 + 9x + 5$$

The solution is The domain is all Real numbers less than or equal to$x = 3.6$., which is option B.

A. The domain is all Real numbers except $x = a,$ where $a \in [0.4, 8.4]$

B. The domain is all Real numbers less than or equal to $x = a,$ where $a \in [1.6, 4.6]$

C. The domain is all Real numbers greater than or equal to $x = a,$ where $a \in [-7.75, 1.25]$

D. The domain is all Real numbers except $x = a$ and $x = b,$ where $a \in [-8.4, -2.4]$ and $b \in [1.83, 8.83]$

E. The domain is all Real numbers.

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

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

$$f(x) = \sqrt[3]{2x + 4}$$

The solution is -502.0, which is option C.

A. $f^{-1}(-10) \in [501.5, 506.2]$

This solution corresponds to distractor 2.

B. $f^{-1}(-10) \in [496.7, 498.8]$

This solution corresponds to distractor 3.

C. $f^{-1}(-10) \in [-503, -499.6]$

* This is the correct solution.

D. $f^{-1}(-10) \in [-500.5, -497.4]$

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

$$f(x) = -18x^2 + 93x + 870$$

The solution is no, which is option C.

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

* This is the solution.

D. Yes, the function is 1-1.

Corresponds to believing the function passes the Horizontal Line test.

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 (if it exists). Then, evaluate the inverse at $x = 10$ and choose the interval the $f^{-1}(10)$ belongs to.

$$f(x) = \sqrt[3]{2x + 4}$$

The solution is 498.0, which is option D.

A. $f^{-1}(10) \in [501.1, 505.8]$

Distractor 1: This corresponds to

B. $f^{-1}(10) \in [-504.2, -498.6]$

This solution corresponds to distractor 3.

C. $f^{-1}(10) \in [-498.9, -495.7]$

This solution corresponds to distractor 2.

D. $f^{-1}(10) \in [495.5, 500.2]$

* This is the correct solution.

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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5. 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 $f^{-1}(9) = 58.598$, which is option B.

A. $f^{-1}(9) \in [442412.39, 442427.39]$

This solution corresponds to distractor 2.

B. $f^{-1}(9) \in [56.6, 60.6]$

This is the solution.

C. $f^{-1}(9) \in [45.6, 55.6]$

This solution corresponds to distractor 3.

D. $f^{-1}(9) \in [152.41, 155.41]$

This solution corresponds to distractor 4.

E. $f^{-1}(9) \in [1202605.28, 1202611.28]$

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

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

The solution is 5.0, which is option B.

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

Distractor 1: Corresponds to reversing the composition.

B. $(f \circ g)(-1) \in [3, 9]$

* This is the correct solution

C. $(f \circ g)(-1) \in [14, 15]$

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

D. $(f \circ g)(-1) \in [-21, -15]$

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

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

The solution is -70.0, which is option B.

A. $(f \circ g)(-1) \in [19, 27]$

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

B. $(f \circ g)(-1) \in [-73, -65]$

* This is the correct solution

C. $(f \circ g)(-1) \in [28, 32]$

Distractor 1: Corresponds to reversing the composition.

D. $(f \circ g)(-1) \in [-66, -56]$

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

$$f(x) = e^{x-2} - 5$$

The solution is $f^{-1}(7) = 4.485$, which is option A.

A. $f^{-1}(7) \in [4.31, 4.6]$

This is the solution.

B. $f^{-1}(7) \in [-3.01, -2.63]$

This solution corresponds to distractor 3.

C. $f^{-1}(7) \in [-3.43, -3.34]$

This solution corresponds to distractor 4.

D. $f^{-1}(7) \in [0.43, 0.88]$

This solution corresponds to distractor 1.

E. $f^{-1}(7) \in [-4.6, -4.26]$

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

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

$$f(x) = \sqrt{-5x - 27} \text{ and } g(x) = 2x^2$$

The solution is The domain is all Real numbers less than or equal to$x = -5.4$., which is option A.

A. The domain is all Real numbers less than or equal to $x = a$, where $a \in [-10.4, 0.6]$

B. The domain is all Real numbers except $x = a$, where $a \in [-10.25, -5.25]$

C. The domain is all Real numbers greater than or equal to $x = a$, where $a \in [-9, -2]$

D. The domain is all Real numbers except $x = a$ and $x = b$, where $a \in [-8.8, -4.8]$ and $b \in [-3.8, 0.2]$

E. The domain is all Real numbers.

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

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

$$f(x) = -24x^2 - 176x - 306$$

The solution is no, which is option C.

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. 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 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.