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 $x = -15$ and choose the interval the $f^{-1}(-15)$ belongs to.

$$f(x) = \sqrt[3]{5x - 2}$$

The solution is -674.6, which is option A.

A. $f^{-1}(-15) \in [-674.9, -674.14]$

* This is the correct solution.

B. $f^{-1}(-15) \in [-675.91, -675.39]$

Distractor 1: This corresponds to

C. $f^{-1}(-15) \in [675.02, 675.54]$

This solution corresponds to distractor 3.

D. $f^{-1}(-15) \in [674.57, 675.24]$

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

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

The solution is 3.0, which is option A.

A. $(f \circ g)(1) \in [1.72, 3.84]$

* This is the correct solution

B. $(f \circ g)(1) \in [8.47, 9.37]$

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

C. $(f \circ g)(1) \in [6.95, 8.28]$

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

D. $(f \circ g)(1) \in [-2.32, -0.32]$

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

$$f(x) = e^{x-5} + 4$$

The solution is $f^{-1}(7) = 6.099$, which is option B.

A. $f^{-1}(7) \in [-3.92, -3.77]$

This solution corresponds to distractor 1.

B. $f^{-1}(7) \in [6.08, 6.18]$

This is the solution.

C. $f^{-1}(7) \in [4.61, 4.72]$

This solution corresponds to distractor 4.

D. $f^{-1}(7) \in [6.44, 6.5]$

This solution corresponds to distractor 3.

E. $f^{-1}(7) \in [6.34, 6.45]$

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

$$f(x) = -18x^2 + 132x - 224$$

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

$$f(x) = \sqrt{4x - 20}$$

The solution is yes, which is option D.

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

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

The solution is 4.0, which is option C.

A. $(f \circ g)(1) \in [-34.1, -31.8]$

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

B. $(f \circ g)(1) \in [-23.9, -21.6]$

Distractor 1: Corresponds to reversing the composition.

C. $(f \circ g)(1) \in [1.9, 7.5]$

* This is the correct solution

D. $(f \circ g)(1) \in [8.4, 10.6]$

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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7. 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.

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

The solution is 249.25, which is option A.

A. $f^{-1}(10) \in [248.46, 249.97]$

* This is the correct solution.

B. $f^{-1}(10) \in [-249.7, -248.81]$

This solution corresponds to distractor 2.

C. $f^{-1}(10) \in [-251.41, -249.48]$

This solution corresponds to distractor 3.

D. $f^{-1}(10) \in [249.4, 252.77]$

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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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.

$$f(x) = e^{x+4} + 2$$

The solution is $f^{-1}(6) = -2.614$, which is option A.

A. $f^{-1}(6) \in [-3.24, -2.5]$

This is the solution.

B. $f^{-1}(6) \in [2.44, 2.76]$

This solution corresponds to distractor 3.

C. $f^{-1}(6) \in [5.09, 5.42]$

This solution corresponds to distractor 1.

D. $f^{-1}(6) \in [3.8, 4.29]$

This solution corresponds to distractor 2.

E. $f^{-1}(6) \in [4.12, 4.68]$

This solution corresponds to distractor 4.

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

$$f(x) = \sqrt{-5x - 13} \text{ and } g(x) = 4x + 6$$

The solution is The domain is all Real numbers less than or equal to$x = -2.6$., which is option C.

A. The domain is all Real numbers except $x = a$, where $a \in [0.17, 7.17]$

B. The domain is all Real numbers greater than or equal to $x = a$, where $a \in [-7.67, 0.33]$

C. The domain is all Real numbers less than or equal to $x = a$, where $a \in [-3.6, -0.6]$

D. The domain is all Real numbers except $x = a$ and $x = b$, where $a \in [4.33, 10.33]$ and $b \in [3.2, 10.2]$

E. The domain is all Real numbers.

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

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

$$f(x) = \sqrt{-5x - 15} \text{ and } g(x) = 5x^3 + 4x^2 + x + 2$$

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

A. The domain is all Real numbers except $x = a$, where $a \in [-9.25, -5.25]$

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

C. The domain is all Real numbers less than or equal to $x = a,$ where $a \in [-5, 1]$

D. The domain is all Real numbers except $x = a$ and $x = b,$ where $a \in [1.2, 10.2]$ and $b \in [6.33, 8.33]$

E. The domain is all Real numbers.

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