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 $x = 10$ and choose the interval that $f^{-1}(10)$ belongs to.
$$f(x) = 3x^2 - 4$$

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

    A. $f^{-1}(10) \in [1.98, 2.31]$

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

    B. $f^{-1}(10) \in [3.1, 3.42]$

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

    C. $f^{-1}(10) \in [3.43, 4.59]$

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

    D. $f^{-1}(10) \in [1.18, 1.51]$

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

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

$$f(x) = 2x^4 + 5x^3 + 7x^2 + 5x + 8 \text{ and } g(x) = \sqrt{-5x - 18}$$

    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 $a \in [-9.2, -2.2]$

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

    C. The domain is all Real numbers greater than or equal to $x = a,$ where $a \in [-7, 3]$

    D. The domain is all Real numbers except $x = a$ and $x = b,$ where $a \in [4.8, 7.8]$ and $b \in [4.6, 7.6]$

    E. The domain is all Real numbers.

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

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

$$f(x) = \sqrt{5x - 31}$$

    The solution is yes, which is option C.

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

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

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.

   * 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.

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4. Find the inverse of the function below. Then, evaluate the inverse at $x = 9$ and choose the interval that $f^{-1}(9)$ belongs to.
$$f(x) = e^{x+4} + 5$$

   The solution is $f^{-1}(9) = -2.614$, which is option B.

   A. $f^{-1}(9) \in [7.36, 7.62]$

      This solution corresponds to distractor 4.

   B. $f^{-1}(9) \in [-2.73, -2.58]$

      This is the solution.

   C. $f^{-1}(9) \in [5.01, 5.74]$

      This solution corresponds to distractor 1.

   D. $f^{-1}(9) \in [7.59, 7.68]$

      This solution corresponds to distractor 2.

   E. $f^{-1}(9) \in [6.57, 7.46]$

      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. Find the inverse of the function below. Then, evaluate the inverse at $x = 7$ and choose the interval that $f^{-1}(7)$ belongs to.
$$f(x) = e^{x+5} + 2$$

   The solution is $f^{-1}(7) = -3.391$, which is option B.

   A. $f^{-1}(7) \in [5.44, 7.75]$

      This solution corresponds to distractor 1.

   B. $f^{-1}(7) \in [-4.57, -3.11]$

      This is the solution.

C. $f^{-1}(7) \in [4.44, 4.74]$

This solution corresponds to distractor 4.

D. $f^{-1}(7) \in [3.99, 4.23]$

This solution corresponds to distractor 2.

E. $f^{-1}(7) \in [1.65, 3.06]$

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

$$f(x) = \sqrt{6x - 38}$$

The solution is yes, which is option B.

   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. Yes, the function is 1-1.

   * This is the solution.

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

$$f(x) = 9x^3 + 6x^2 + 5x + 8 \text{ and } g(x) = \sqrt{4x - 30}$$

The solution is The domain is all Real numbers greater than or equal to $x = 7.5.$, which is option B.

   A. The domain is all Real numbers except $x = a,$ where $a \in [-4.25, 9.75]$

   B. The domain is all Real numbers greater than or equal to $x = a,$ where $a \in [4.5, 14.5]$

   C. The domain is all Real numbers less than or equal to $x = a,$ where $a \in [3.8, 6.8]$

   D. The domain is all Real numbers except $x = a$ and $x = b,$ where $a \in [5.4, 6.4]$ and $b \in [-8.8, 0.2]$

   E. The domain is all Real numbers.

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

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

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

The solution is -9.0, which is option A.

   A. $(f \circ g)(1) \in [-11.4, -7.3]$

      * This is the correct solution

   B. $(f \circ g)(1) \in [-7.6, -4.8]$

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

   C. $(f \circ g)(1) \in [-1.7, 4.1]$

      Distractor 1: Corresponds to reversing the composition.

   D. $(f \circ g)(1) \in [-5.5, -2.9]$

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

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

The solution is -2.0, which is option B.

   A. $(f \circ g)(-1) \in [8.9, 14.2]$

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

   B. $(f \circ g)(-1) \in [-3.2, -0.6]$

      * This is the correct solution

   C. $(f \circ g)(-1) \in [-1.5, 2.9]$

      Distractor 1: Corresponds to reversing the composition.

   D. $(f \circ g)(-1) \in [-13.8, -11.2]$

      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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10. 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.
$$f(x) = \sqrt[3]{3x - 5}$$

The solution is 335.0, which is option C.

   A. $f^{-1}(10) \in [-331.67, -324.67]$

      This solution corresponds to distractor 3.

   B. $f^{-1}(10) \in [-337, -332]$

      This solution corresponds to distractor 2.

C. $f^{-1}(10) \in [332, 338]$

 * This is the correct solution.

D. $f^{-1}(10) \in [326.67, 334.67]$

 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!