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.

---

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

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

The solution is 1.0, which is option B.

A. $(f \circ g)(-1) \in [7, 14]$

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

B. $(f \circ g)(-1) \in [0, 3]$

* This is the correct solution

C. $(f \circ g)(-1) \in [69, 79]$

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

D. $(f \circ g)(-1) \in [76, 88]$

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!

---

2. 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. $f^{-1}(10) \in [4.75, 5.55]$

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

B. $f^{-1}(10) \in [-0.04, 1.42]$

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

C. $f^{-1}(10) \in [2.38, 4.3]$

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

D. $f^{-1}(10) \in [1.59, 2.01]$

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!

---

3. 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 C.

A. $f^{-1}(-10) \in [248.25, 250.25]$

This solution corresponds to distractor 2.

B. $f^{-1}(-10) \in [250.75, 252.75]$

This solution corresponds to distractor 3.

C. $f^{-1}(-10) \in [-249.25, -247.25]$

* This is the correct solution.

D. $f^{-1}(-10) \in [-252.75, -249.75]$

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!

---

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

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

The solution is 28.0, which is option B.

A. $(f \circ g)(1) \in [23, 26]$

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

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

* This is the correct solution

C. $(f \circ g)(1) \in [-54, -50]$

Distractor 1: Corresponds to reversing the composition.

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

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!

---

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

$$f(x) = \sqrt{6x - 20}$$

The solution is yes, which is option D.

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.

   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 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.

---

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

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

The solution is $f^{-1}(8) = 406.429$, which is option E.

A. $f^{-1}(8) \in [397.43, 401.43]$

   This solution corresponds to distractor 3.

B. $f^{-1}(8) \in [22027.47, 22031.47]$

   This solution corresponds to distractor 1.

C. $f^{-1}(8) \in [144.41, 151.41]$

   This solution corresponds to distractor 4.

D. $f^{-1}(8) \in [59876.14, 59877.14]$

   This solution corresponds to distractor 2.

E. $f^{-1}(8) \in [403.43, 408.43]$

   This is the solution.

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

---

7. 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 $f^{-1}(6) = -1.921$, which is option A.

A. $f^{-1}(6) \in [-2.99, -1.9]$

   This is the solution.

B. $f^{-1}(6) \in [5.92, 6.27]$

   This solution corresponds to distractor 1.

C. $f^{-1}(6) \in [0.1, 1.54]$

This solution corresponds to distractor 4.

D. $f^{-1}(6) \in [-1.36, -0.9]$

This solution corresponds to distractor 3.

E. $f^{-1}(6) \in [-0.78, -0.48]$

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

---

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

$$f(x) = \sqrt{4x - 17} \text{ and } g(x) = 9x + 7$$

The solution is The domain is all Real numbers greater than or equal to$x = 4.25$., which is option C.

A. The domain is all Real numbers except $x = a$, where $a \in [1.8, 6.8]$

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

C. The domain is all Real numbers greater than or equal to $x = a$, where $a \in [-4.75, 6.25]$

D. The domain is all Real numbers except $x = a$ and $x = b$, where $a \in [-9.83, -1.83]$ and $b \in [1.2, 9.2]$

E. The domain is all Real numbers.

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

---

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

$$f(x) = \sqrt{-6x + 29}$$

The solution is yes, which is option A.

A. Yes, the function is 1-1.

* This is the solution.

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

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

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.

---

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

$$f(x) = 7x^3 + 9x^2 + 5x + 7 \text{ and } g(x) = 7x^4 + 9x^3 + 4x + 2$$

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

A. The domain is all Real numbers except $x = a,$ where $a \in [3.75, 8.75]$

B. The domain is all Real numbers less than or equal to $x = a,$ where $a \in [-4, 0]$

C. The domain is all Real numbers greater than or equal to $x = a,$ where $a \in [-6.67, -1.67]$

D. The domain is all Real numbers except $x = a$ and $x = b,$ where $a \in [2.33, 7.33]$ and $b \in [-0.4, 8.6]$

E. The domain is all Real numbers.

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