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.

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

The solution is 0.0, which is option C.

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

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

B. $(f \circ g)(1) \in [10, 16]$

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

C. $(f \circ g)(1) \in [0, 2]$

* This is the correct solution

D. $(f \circ g)(1) \in [-31, -27]$

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

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

The solution is -2.0, which is option A.

A. $(f \circ g)(1) \in [-2, 4]$

* This is the correct solution

B. $(f \circ g)(1) \in [4, 13]$

Distractor 1: Corresponds to reversing the composition.

C. $(f \circ g)(1) \in [20, 21]$

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

D. $(f \circ g)(1) \in [-12, -10]$

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!

---

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

$$f(x) = 3x^3 + 7x^2 + 3x + 3 \text{ and } g(x) = 6x + 8$$

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

A. The domain is all Real numbers less than or equal to $x = a$, where $a \in [4, 7]$

B. The domain is all Real numbers except $x = a$, where $a \in [4.83, 6.83]$

C. The domain is all Real numbers greater than or equal to $x = a$, where $a \in [7.33, 11.33]$

D. The domain is all Real numbers except $x = a$ and $x = b$, where $a \in [-3.2, 5.8]$ and $b \in [5.4, 7.4]$

E. The domain is all Real numbers.

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

---

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

$$f(x) = (6x + 39)^3$$

The solution is yes, which is option B.

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.

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

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

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.

---

5. Find the inverse of the function below (if it exists). Then, evaluate the inverse at $x = -13$ and choose the interval that $f^{-1}(-13)$ belongs to.

$$f(x) = 2x^2 + 5$$

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

A. $f^{-1}(-13) \in [1.9, 2.35]$

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

B. $f^{-1}(-13) \in [5.61, 6.01]$

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

C. $f^{-1}(-13) \in [2.8, 3.48]$

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

D. $f^{-1}(-13) \in [7.96, 8.38]$

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!

---

6. Find the inverse of the function below (if it exists). Then, evaluate the inverse at $x = -12$ and choose the interval that $f^{-1}(-12)$ belongs to.

$$f(x) = 5x^2 + 4$$

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

A. $f^{-1}(-12) \in [2.64, 2.84]$

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

B. $f^{-1}(-12) \in [4.45, 5.76]$

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

C. $f^{-1}(-12) \in [1.77, 2.56]$

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

D. $f^{-1}(-12) \in [0.92, 1.55]$

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!

---

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

$$f(x) = (6x + 34)^3$$

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

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

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

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

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.

---

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

$$f(x) = e^{x-4} - 3$$

The solution is $f^{-1}(9) = 6.485$, which is option E.

A. $f^{-1}(9) \in [-1.24, -1.19]$

This solution corresponds to distractor 2.

B. $f^{-1}(9) \in [-1.55, -1.48]$

This solution corresponds to distractor 1.

C. $f^{-1}(9) \in [-0.48, -0.33]$

This solution corresponds to distractor 3.

D. $f^{-1}(9) \in [-1.48, -1.36]$

This solution corresponds to distractor 4.

E. $f^{-1}(9) \in [6.48, 6.58]$

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

---

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

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

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

A. The domain is all Real numbers less than or equal to $x = a,$ where $a \in [-2.4, 10.6]$

B. The domain is all Real numbers except $x = a,$ where $a \in [-7.83, 0.17]$

C. The domain is all Real numbers greater than or equal to $x = a,$ where $a \in [2.5, 8.5]$

D. The domain is all Real numbers except $x = a$ and $x = b,$ where $a \in [1.67, 10.67]$ and $b \in [-14.2, -2.2]$

E. The domain is all Real numbers.

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

---

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

$$f(x) = e^{x+3} + 5$$

The solution is $f^{-1}(8) = -1.901$, which is option E.

A. $f^{-1}(8) \in [7.46, 7.6]$

This solution corresponds to distractor 2.

B. $f^{-1}(8) \in [4.07, 4.19]$

This solution corresponds to distractor 1.

C. $f^{-1}(8) \in [7.3, 7.44]$

This solution corresponds to distractor 4.

D. $f^{-1}(8) \in [6.44, 6.65]$

This solution corresponds to distractor 3.

E. $f^{-1}(8) \in [-2.12, -1.87]$

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