

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. Evaluate f composed with g at $x = 1$.

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

The solution is -60.0 .

Plausible alternative answers include: Distractor 3: Corresponds to being slightly off from the solution. Distractor 2: Corresponds to being slightly off from the solution. * This is the correct solution Distractor 1: Corresponds to reversing the composition.

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). If the inverse exists, evaluate the inverse at $x = 12.0$

$$f(x) = 3x^2 + 5$$

The solution is The function is not invertible for all Real numbers. .

Plausible alternative answers include: Distractor 3: This corresponds to finding the (nonexistent) inverse and dividing by a negative. Distractor 4: This corresponds to both distractors 2 and 3. Distractor 2: This corresponds to finding the (nonexistent) inverse and not subtracting by the vertical shift. Distractor 1: This corresponds to trying to find the inverse even though the function is not 1-1. * 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). If the inverse exists, evaluate the inverse at $x = 6$.

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

The solution is $f^{-1}(6) = 2977.958$.

Plausible alternative answers include: This solution corresponds to distractor 1. This is the solution. This solution corresponds to distractor 2. This solution corresponds to distractor 3. 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 $e^y = x \leftrightarrow y = \ln(x)$.

4. Determine whether the function below is 1-1. Provide reasoning for your response.

$$f(x) = -15x^2 - 148x - 357$$

The solution is no.

Plausible alternative answers include:Corresponds to believing the function passes the Horizontal Line test. Corresponds to the Vertical Line test, which checks if an expression is a function.

Corresponds to believing 1-1 means the range is all Real numbers. * This is the solution. 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.

5. Multiply the following functions and write the domain of the resulting function.

$$f(x) = \frac{4}{3x - 10} \text{ and } g(x) = \frac{1}{3x - 10}$$

The solution is The domain is all Real numbers except $x = 3.33$ and $x = 3.33$.

Plausible alternative answers include:

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

6. Find the inverse of the function below (if it exists). If the inverse exists, evaluate the inverse at $x = 14.0$

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

The solution is 686.5.

Plausible alternative answers include: Distractor 1: This corresponds to This solution corresponds to distractor 3. * This is the correct solution. This solution corresponds to distractor 2. This solution corresponds to distractor 4.

General Comment: Be sure you check that the function is 1-1 before trying to find the inverse!

7. Find the inverse of the function below (if it exists). If the inverse exists, evaluate the inverse at $x = 8$.

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

The solution is $f^{-1}(8) = -2.901$.

Plausible alternative answers include: This solution corresponds to distractor 2. This solution corresponds to distractor 3. This is the solution. This solution corresponds to distractor 4. 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 $e^y = x \leftrightarrow y = \ln(x)$.

8. Add the following functions and write the domain of the resulting function.

$$f(x) = \frac{1}{5x + 16} \text{ and } g(x) = 7x^3 + 8x^2 + 6x + 9$$

The solution is The domain is all Real numbers except $x = -3.2$.

Plausible alternative answers include:

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

9. Determine whether the function below is 1-1. Provide reasoning for your response.

$$f(x) = -20x^2 - 151x - 285$$

The solution is no.

Plausible alternative answers include: Corresponds to believing the function passes the Horizontal Line test. Corresponds to believing 1-1 means the range is all Real numbers. Corresponds to the Vertical Line test, which checks if an expression is a function. Corresponds to believing 1-1 means the domain is all Real numbers. * This is the solution.

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. Evaluate f composed with g at $x = -1$.

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

The solution is -5.0 .

Plausible alternative answers include: Distractor 3: Corresponds to being slightly off from the solution. Distractor 2: Corresponds to being slightly off from the solution. Distractor 1: Corresponds to reversing the composition. * This is the correct solution

General Comment: f composed with g at x means $f(g(x))$. The order matters!

11. Evaluate f composed with g at $x = -1$.

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

The solution is -17.0 .

Plausible alternative answers include: Distractor 1: Corresponds to reversing the composition. * This is the correct solution Distractor 3: Corresponds to being slightly off from the solution. Distractor 2: Corresponds to being slightly off from the solution.

General Comment: f composed with g at x means $f(g(x))$. The order matters!

12. Find the inverse of the function below (if it exists). If the inverse exists, evaluate the inverse at $x = -15.0$

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

The solution is The function is not invertible for all Real numbers. .

Plausible alternative answers include: Distractor 1: This corresponds to trying to find the inverse even though the function is not 1-1. Distractor 2: This corresponds to finding the (nonexistent) inverse and not subtracting by the vertical shift. Distractor 3: This corresponds to finding the (nonexistent) inverse and dividing by a negative. Distractor 4: This corresponds to both distractors 2 and 3. * This is the correct option.

General Comment: Be sure you check that the function is 1-1 before trying to find the inverse!

13. Find the inverse of the function below (if it exists). If the inverse exists, evaluate the inverse at $x = 7$.

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

The solution is $f^{-1}(7) = 3.693$.

Plausible alternative answers include: This solution corresponds to distractor 3. This solution corresponds to distractor 4. This is the solution. This solution corresponds to distractor 2. 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 $e^y = x \leftrightarrow y = \ln(x)$.

14. Determine whether the function below is 1-1. Provide reasoning for your response.

$$f(x) = 36x^2 - 192x + 256$$

The solution is no.

Plausible alternative answers include: Corresponds to believing 1-1 means the domain is all Real numbers. Corresponds to believing 1-1 means the range is all Real numbers. Corresponds to believing the function passes the Horizontal Line test. Corresponds to the Vertical Line test, which checks if an expression is a function. * This is the solution.

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.

15. Multiply the following functions and write the domain of the resulting function.

$$f(x) = 6x + 7 \text{ and } g(x) = \sqrt{-6x + 22}$$

The solution is The domain is all Real numbers less than or equal to $x = 3.67$.

Plausible alternative answers include:

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

16. Find the inverse of the function below (if it exists). If the inverse exists, evaluate the inverse at $x = 12.0$

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

The solution is The function is not invertible for all Real numbers. .

Plausible alternative answers include: Distractor 1: This corresponds to trying to find the inverse even though the function is not 1-1. Distractor 2: This corresponds to finding the (nonexistent) inverse and not subtracting by the vertical shift. Distractor 3: This corresponds to finding the (nonexistent) inverse and dividing by a negative. Distractor 4: This corresponds to both distractors 2 and 3. * This is the correct option.

General Comment: Be sure you check that the function is 1-1 before trying to find the inverse!

17. Find the inverse of the function below (if it exists). If the inverse exists, evaluate the inverse at $x = 8$.

$$f(x) = \ln(x + 3) - 4$$

The solution is $f^{-1}(8) = 162751.791$.

Plausible alternative answers include: This solution corresponds to distractor 1. This solution corresponds to distractor 3. This solution corresponds to distractor 4. This solution corresponds to distractor 2. 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 $e^y = x \leftrightarrow y = \ln(x)$.

18. Add the following functions and write the domain of the resulting function.

$$f(x) = 7x^3 + 7x + 1 \text{ and } g(x) = \sqrt{5x + 26}$$

The solution is The domain is all Real numbers greater than or equal to $x = -5.2$.

Plausible alternative answers include:

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

19. Determine whether the function below is 1-1. Provide reasoning for your response.

$$f(x) = (6x + 31)^3$$

The solution is yes.

Plausible alternative answers include: Corresponds to the Vertical Line test, which checks if an expression is a function. Corresponds to believing 1-1 means the domain is all Real numbers. Corresponds to the Horizontal Line test, which this function passes. * This is the solution. 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.

20. Evaluate f composed with g at $x = 1$.

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

The solution is 32.0.

Plausible alternative answers include:* This is the correct solution Distractor 1: Corresponds to reversing the composition. Distractor 3: Corresponds to being slightly off from the solution. Distractor 2: Corresponds to being slightly off from the solution.

General Comment: f composed with g at x means $f(g(x))$. The order matters!

21. Evaluate f composed with g at $x = 1$.

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

The solution is -85.0.

Plausible alternative answers include:* This is the correct solution Distractor 1: Corresponds to reversing the composition. Distractor 3: Corresponds to being slightly off from the solution. Distractor 2: Corresponds to being slightly off from the solution.

General Comment: f composed with g at x means $f(g(x))$. The order matters!

22. Find the inverse of the function below (if it exists). If the inverse exists, evaluate the inverse at $x = -12$.

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

The solution is -432.75 .

Plausible alternative answers include: This solution corresponds to distractor 2. This solution corresponds to distractor 3. * This is the correct solution. Distractor 1: This corresponds to This solution corresponds to distractor 4.

General Comment: Be sure you check that the function is 1-1 before trying to find the inverse!

23. Find the inverse of the function below (if it exists). If the inverse exists, evaluate the inverse at $x = 9$.

$$f(x) = \ln(x - 2) - 4$$

The solution is $f^{-1}(9) = 442415.392$.

Plausible alternative answers include: This solution corresponds to distractor 2. This solution corresponds to distractor 3. This solution corresponds to distractor 4. This solution corresponds to distractor 1. 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 $e^y = x \leftrightarrow y = \ln(x)$.

24. Determine whether the function below is 1-1. Provide reasoning for your response.

$$f(x) = -25x^2 + 195x - 360$$

The solution is no.

Plausible alternative answers include:Corresponds to believing 1-1 means the range is all Real numbers. Corresponds to believing the function passes the Horizontal Line test. Corresponds to the Vertical Line test, which checks if an expression is a function. Corresponds to believing 1-1 means the domain is all Real numbers. * This is the solution.

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.

25. Add the following functions and write the domain of the resulting function.

$$f(x) = x^4 + 9x^3 + 7x^2 + 7x + 3 \text{ and } g(x) = 6x^2 + 2x + 1$$

The solution is $(-\infty, \infty)$.

Plausible alternative answers include:

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

26. Find the inverse of the function below (if it exists). If the inverse exists, evaluate the inverse at $x = -15.0$

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

The solution is The function is not invertible for all Real numbers. .

Plausible alternative answers include: Distractor 3: This corresponds to finding the (nonexistent) inverse and dividing by a negative. Distractor 4: This corresponds to both distractors 2 and 3. Distractor 1: This corresponds to trying to find the inverse even though the function is not 1-1. Distractor 2: This corresponds to finding the (nonexistent) inverse and not subtracting by the vertical shift. * This is the correct option.

General Comment: Be sure you check that the function is 1-1 before trying to find the inverse!

27. Find the inverse of the function below (if it exists). If the inverse exists, evaluate the inverse at $x = 9$.

$$f(x) = \ln(x + 4) + 3$$

The solution is $f^{-1}(9) = 399.429$.

Plausible alternative answers include: This is the solution. This solution corresponds to distractor 1. This solution corresponds to distractor 3. This solution corresponds to distractor 2. 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 $e^y = x \leftrightarrow y = \ln(x)$.

28. Add the following functions and write the domain of the resulting function.

$$f(x) = \frac{3}{5x + 17} \text{ and } g(x) = 4x^3 + 8x^2 + 5x + 6$$

The solution is The domain is all Real numbers except $x = -3.4$.

Plausible alternative answers include:

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

29. Determine whether the function below is 1-1. Provide reasoning for your response.

$$f(x) = (5x + 36)^3$$

The solution is yes.

Plausible alternative answers include:Corresponds to the Horizontal Line test, which this function passes. Corresponds to believing 1-1 means the range is all Real numbers. * This is the solution. Corresponds to the Vertical Line test, which checks if an expression is a function. 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.

30. Evaluate f composed with g at $x = 1$.

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

The solution is 1.0.

Plausible alternative answers include:* This is the correct solution Distractor 3: Corresponds to being slightly off from the solution. Distractor 2: Corresponds to being slightly off from the solution. Distractor 1: Corresponds to reversing the composition.

General Comment: f composed with g at x means $f(g(x))$. The order matters!
