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. 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!

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2. 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!

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

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4. 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.

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5. 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.

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6. 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!

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

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8. 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.

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9. 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.

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10. 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!
