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. Solve the rational equation below.

$$\frac{-4x}{-2x+7} + \frac{-3x^2}{-14x^2+35x+49} = \frac{3}{7x+7}$$

The solution is All solutions are invalid or lead to complex values in the equation..

Plausible alternative answers include:$x = -1.000$, which corresponds to solving $7x + 7 = 0$ and treating it as a solution to the equation. $x = 0.364$ and $x = -1.244$, which corresponds to making the discriminant from the Quadratic Formula positive to avoid complex solutions. $x = 3.500$ and $x = -1.000$, which corresponds to solving $-2x+7 = 0$ and $7x+7 = 0$ and treating them as solutions to the equation. * The equation leads to solving $-25x^2 - 22x - 21 = 0$, which leads to complex solutions. This is the correct option. $x = 3.500$, which corresponds to solving $-2x + 7 = 0$ and treating it as a solution to the equation.

General Comment: Distractors are different based on the number of solutions. Remember that after solving, we need to make sure our solution does not make the original equation divide by zero!

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2. Determine the domain of the function below.

$$f(x) = \frac{4}{25x^2 - 5x - 12}$$

The solution is All Real numbers except $x = -0.600$ and $x = 0.800$..

Plausible alternative answers include: This corresponds to thinking the denominator has complex roots or that rational functions have a domain of all Real numbers. All Real numbers except $x = -15.000$, which corresponds to removing a distractor value from the denominator. All Real numbers except $x = -0.600$ and $x = 0.800$, which is the correct option. All Real numbers except $x = -15.000$ and $x = 20.000$, which corresponds to not factoring the denominator correctly. All Real numbers except $x = -0.600$, which corresponds to removing only 1 value from the denominator.

General Comment: Recall that dividing by zero is not a real number. Therefore the domain is all real numbers **except** those that make the denominator 0.

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3. Solve the rational equation below.

$$\frac{3}{8x+7} + 5 = \frac{3}{-32x-28}$$

The solution is $x = -0.969$.

Plausible alternative answers include: This corresponds to thinking $x = -0.969$ leads to dividing by zero in the original equation, which it does not. $x = 0.781$, which corresponds to not distributing the factor $8x+7$ correctly when trying to eliminate the fraction. $x = -0.969$ and $x = 0.781$, which corresponds to getting the correct solution and believing there should be a second

solution to the equation. * $x = -0.969$, which is the correct option. $x = -0.969$ and $x = -0.875$, which corresponds to getting the correct solution and believing there should be a second solution to the equation.

General Comment: Distractors are different based on the number of solutions. Remember that after solving, we need to make sure our solution does not make the original equation divide by zero!

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4. Solve the rational equation below.

$$\frac{-98}{-42x+42} + 1 = \frac{-98}{-42x+42}$$

The solution is all solutions are invalid or lead to complex values in the equation..

Plausible alternative answers include:$x = 1.000$ and $x = 1.000$, which corresponds to getting the correct solution and believing there should be a second solution to the equation. $x = 1.000$, which corresponds to not checking if this value leads to dividing by 0 in the original equation and thus is not a valid solution. $x = -1.000$, which corresponds to not distributing the factor $-42x + 42$ correctly when trying to eliminate the fraction. $x = -1.000$ and $x = 1.000$, which corresponds to getting the correct solution and believing there should be a second solution to the equation. *$x = 1.000$ leads to dividing by 0 in the original equation and thus is not a valid solution, which is the correct option.

General Comment: Distractors are different based on the number of solutions. Remember that after solving, we need to make sure our solution does not make the original equation divide by zero!

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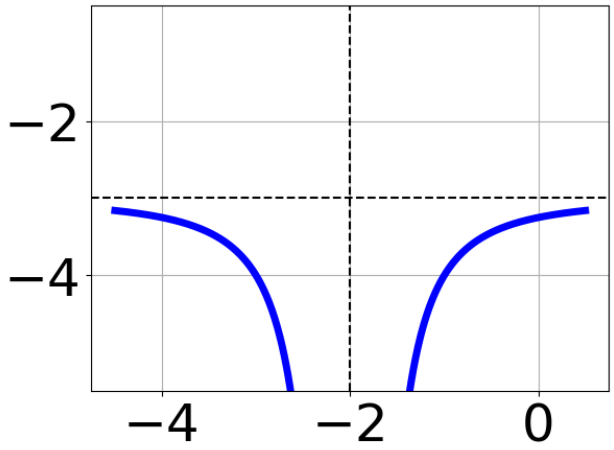
5. Write an equation that can represent the function graphed below.



The solution is $f(x) = \frac{-1}{(x+2)^2} - 3$.

Plausible alternative answers include: Corresponds to thinking the graph was a shifted version of $\frac{1}{x}$, using the general form $f(x) = \frac{a}{(x+h)^2} + k$, and the opposite leading coefficient. Corresponds to using the general form $f(x) = \frac{a}{(x+h)^2} + k$ and the opposite leading coefficient. Corresponds to thinking the graph was a shifted version of $\frac{1}{x}$. This is the correct option. This corresponds to believing the vertex of the graph was not correct.

General Comment: Remember that the general form of a basic rational equation is $f(x) = \frac{a}{(x-h)^n} + k$, where a is the leading coefficient (and in this case, we assume is either 1 or -1), n is the degree (in this case, either 1 or 2), and (h, k) is the intersection of the asymptotes.

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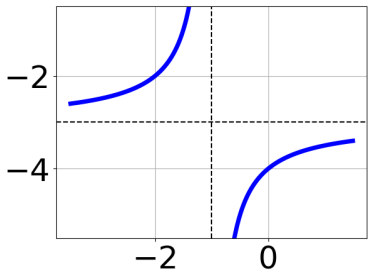
6. Sketch a graph that represents the equation below.

$$f(x) = \frac{-1}{x+1} - 3$$

The solution is the graph below.



General Comment: Remember that the general form of a basic rational equation is $f(x) = \frac{a}{(x-h)^n} + k$, where a is the leading coefficient (and in this case, we assume is either 1 or -1), n is the degree (in this case, either 1 or 2), and (h, k) is the intersection of the asymptotes.

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7. Determine the domain of the function below.

$$f(x) = \frac{4}{9x^2 - 27x + 20}$$

The solution is All Real numbers except $x = 1.333$ and $x = 1.667$..

Plausible alternative answers include: All Real numbers except $x = 12.000$ and $x = 15.000$, which corresponds to not factoring the denominator correctly. This corresponds to thinking the denominator has complex roots or that rational functions have a domain of all Real numbers. All Real numbers except $x = 1.333$, which corresponds to removing only 1 value from the denominator. All Real numbers except $x = 1.333$ and $x = 1.667$, which is the correct option. All Real numbers except $x = 12.000$, which corresponds to removing a distractor value from the denominator.

General Comment: Recall that dividing by zero is not a real number. Therefore the domain is all real numbers **except** those that make the denominator 0.

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8. Solve the rational equation below.

$$\frac{-2x}{-6x+5} + \frac{-5x^2}{30x^2 - 43x + 15} = \frac{-4}{-5x+3}$$

The solution is There are two solutions: $x = 0.764$ and $x = 5.236$.

Plausible alternative answers include:* $x = 0.764$ and $x = 5.236$, which is the correct option.

General Comment: Distractors are different based on the number of solutions. Remember that after solving, we need to make sure our solution does not make the original equation divide by zero!

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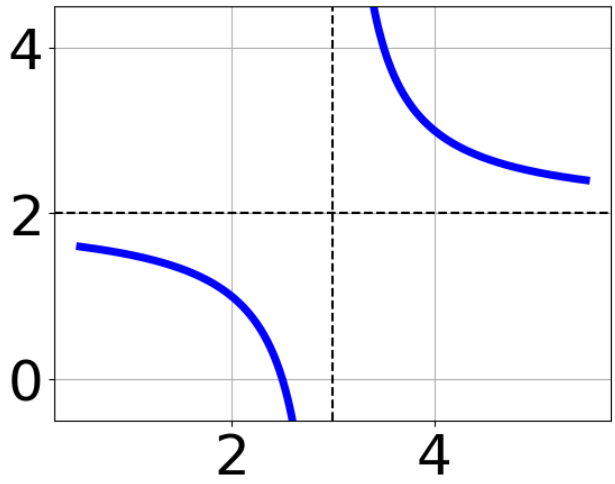
9. Write an equation that can represent the function graphed below.



The solution is $f(x) = \dfrac{1}{x-3} + 2$.

Plausible alternative answers include: This is the correct option. Corresponds to thinking the graph was a shifted version of $\dfrac{1}{x^2}$, using the general form $f(x) = \dfrac{a}{x+h} + k$, and the opposite leading coefficient. Corresponds to thinking the graph was a shifted version of $\dfrac{1}{x^2}$. Corresponds to using the general form $f(x) = \dfrac{a}{x+h} + k$ and the opposite leading coefficient. This corresponds to believing the vertex of the graph was not correct.

General Comment: Remember that the general form of a basic rational equation is $f(x) = \dfrac{a}{(x-h)^n} + k$, where a is the leading coefficient (and in this case, we assume is either 1 or -1), n is the degree (in this case, either 1 or 2), and (h, k) is the intersection of the asymptotes.

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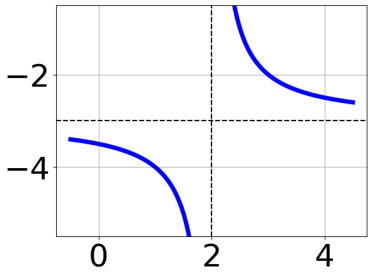
10. Sketch a graph that represents the equation below.

$$f(x) = \frac{1}{x-2} - 3$$

The solution is the graph below.



General Comment: Remember that the general form of a basic rational equation is $f(x) = \dfrac{a}{(x-h)^n} + k$, where a is the leading coefficient (and in this case, we assume is either 1 or -1), n is the degree (in this case, either 1 or 2), and (h, k) is the intersection of the asymptotes.
