

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.*

31. Determine the domain of the function below.

$$f(x) = \frac{6}{18x^2 + 36x + 16}$$

The solution is All Real numbers except  $x = -1.333$  and  $x = -0.667$ .

- A. All Real numbers except  $x = a$  and  $x = b$ , where  $a \in [-24.4, -22.8]$  and  $b \in [-12.1, -11.9]$

All Real numbers except  $x = -24.000$  and  $x = -12.000$ , which corresponds to not factoring the denominator correctly.

- B. All Real numbers except  $x = a$  and  $x = b$ , where  $a \in [-2.3, -0.9]$  and  $b \in [-0.9, 0.9]$

All Real numbers except  $x = -1.333$  and  $x = -0.667$ , which is the correct option.

- C. All Real numbers except  $x = a$ , where  $a \in [-24.4, -22.8]$

All Real numbers except  $x = -24.000$ , which corresponds to removing a distractor value from the denominator.

- D. All Real numbers.

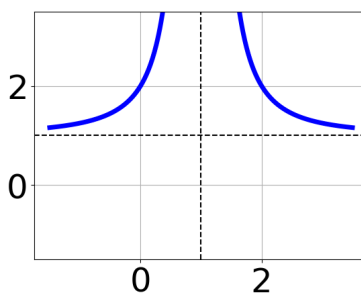
This corresponds to thinking the denominator has complex roots or that rational functions have a domain of all Real numbers.

- E. All Real numbers except  $x = a$ , where  $a \in [-2.3, -0.9]$

All Real numbers except  $x = -1.333$ , which corresponds to removing only 1 value from the denominator.

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

32. Choose the equation of the function graphed below.



The solution is None of the above as it should be  $f(x) = \frac{1}{(x-1)^2} + 1$

- A.  $f(x) = \frac{1}{x-1} - 4$

Corresponds to thinking the graph was a shifted version of  $\frac{1}{x}$  AND not noticing the  $y$ -value was wrong.

B.  $f(x) = \frac{-1}{(x+1)^2} - 4$

Corresponds to using the general form  $f(x) = \frac{a}{(x+h)^2} + k$ , the opposite leading coefficient, AND not noticing the  $y$ -value was wrong.

C.  $f(x) = \frac{-1}{x+1} - 4$

Corresponds to thinking the graph was a shifted version of  $\frac{1}{x}$ , using the general form  $f(x) = \frac{a}{(x+h)^2} + k$ , the opposite leading coefficient, AND not noticing the  $y$ -value was wrong.

D.  $f(x) = \frac{1}{(x-1)^2} - 4$

The  $y$ -value of the equation does not match the graph.

E. None of the above

None of the equation options were the correct equation.

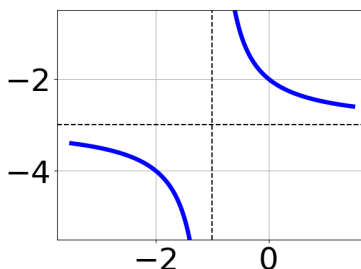
General Comments: Remember that the general form of a basic rational equation is  $f(x) = \frac{a}{(x-h)^n} + k$ , where  $a$  is the leading coefficient (and in this case, we assume is either 1 or  $-1$ ),  $n$  is the degree (in this case, either 1 or 2), and  $(h, k)$  is the intersection of the asymptotes.

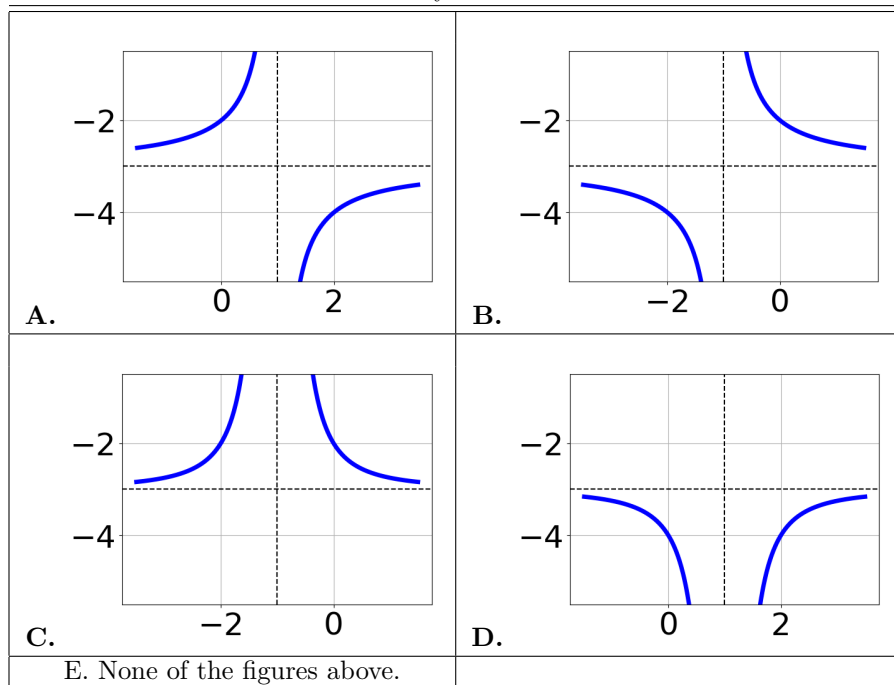
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33. Choose the graph of the equation below.

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

The solution is





A. This is the correct option.

B. Corresponds to using the general form  $f(x) = \frac{a}{x+h} + k$  and the opposite leading coefficient.

C. Corresponds to thinking the graph was a shifted version of  $\frac{1}{x^2}$ .

D. Corresponds to thinking the graph was a shifted version of  $\frac{1}{x^2}$ , using the general form  $f(x) = \frac{a}{x+h} + k$ , and the opposite leading coefficient.

General Comments: 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.

34. Solve the rational equation below. Then, choose the interval(s) that the solution(s) belongs to.

$$\frac{-40}{-20x-60} + 1 = \frac{-40}{-20x-60}$$

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

A.  $x_1 \in [-4, -1]$  and  $x_2 \in [2, 4]$

$x = -3.000$  and  $x = 3.000$ , which corresponds to getting the correct solution and believing there should be a second solution to the equation.

B. All solutions lead to invalid or complex values in the equation.

\* $x = -3.000$  leads to dividing by 0 in the original equation and thus is not a valid solution, which is the correct option.

C.  $x \in [1, 4]$

$x = 3.000$ , which corresponds to not distributing the factor  $-20x-60$  correctly when trying to eliminate the fraction.

D.  $x \in [-4.0, 0.0]$

$x = -3.000$ , which corresponds to not checking if this value leads to dividing by 0 in the original equation and thus is not a valid solution.

E.  $x_1 \in [-4, -1]$  and  $x_2 \in [-4, -2]$

$x = -3.000$  and  $x = -3.000$ , which corresponds to getting the correct solution and believing there should be a second solution to the equation.

General Comments: 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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35. Solve the rational equation below. Then, choose the interval(s) that the solution(s) belongs to.

$$\frac{5x}{6x-3} + \frac{-5x^2}{12x^2-48x+21} = \frac{-7}{2x-7}$$

The solution is There are two solutions:  $x = 1.466$  and  $x = -2.866$

A.  $x_1 \in [0.8, 2.4]$  and  $x_2 \in [-1.6, 3.3]$

B.  $x_1 \in [0.8, 2.4]$  and  $x_2 \in [-3.6, -0.8]$

\*  $x = 1.466$  and  $x = -2.866$ , which is the correct option.

C. All solutions lead to invalid or complex values in the equation.

D.  $x \in [2.8, 3.8]$

E.  $x \in [-4.4, 0.6]$

General Comments: 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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