

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

$$\frac{-9}{5x+6} + 5 = \frac{-4}{-45x-54}$$

The solution is $x = -0.822$

A. $x \in [-0.82, 0.18]$

* $x = -0.822$, which is the correct option.

B. $x_1 \in [-0.95, -0.8]$ and $x_2 \in [0, 3]$

$x = -0.822$ and $x = 1.578$, which corresponds to getting the correct solution and believing there should be a second solution to the equation.

C. $x \in [1.51, 1.62]$

$x = 1.578$, which corresponds to not distributing the factor $5x + 6$ correctly when trying to eliminate the fraction.

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

This corresponds to thinking $x = -0.822$ leads to dividing by zero in the original equation, which it does not.

E. $x_1 \in [-1.11, -0.84]$ and $x_2 \in [-7, 0]$

$x = -1.000$ and $x = -0.822$, 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!

32. Determine the domain of the function below.

$$f(x) = \frac{4}{12x^2 + 3x - 15}$$

The solution is All Real numbers except $x = -1.250$ and $x = 1.000$.

A. All Real numbers except $x = a$, where $a \in [-21.3, -19.1]$

All Real numbers except $x = -20.000$, which corresponds to removing a distractor value from the denominator.

B. All Real numbers except $x = a$ and $x = b$, where $a \in [-21.3, -19.1]$ and $b \in [8.7, 9.2]$

All Real numbers except $x = -20.000$ and $x = 9.000$, which corresponds to not factoring the denominator correctly.

C. All Real numbers.

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

D. All Real numbers except $x = a$, where $a \in [-1.4, -0.5]$

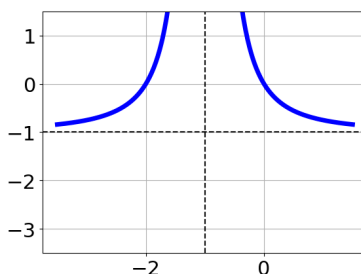
All Real numbers except $x = -1.250$, which corresponds to removing only 1 value from the denominator.

E. All Real numbers except $x = a$ and $x = b$, where $a \in [-1.4, -0.5]$ and $b \in [0.7, 1.7]$

All Real numbers except $x = -1.250$ and $x = 1.000$, which is the correct option.

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

33. Choose the equation of the function graphed below.



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

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

Corresponds to using the general form $f(x) = \frac{a}{(x+h)^2} + k$ and the opposite leading coefficient.

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

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.

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

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

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

This is the correct option.

E. None of the above

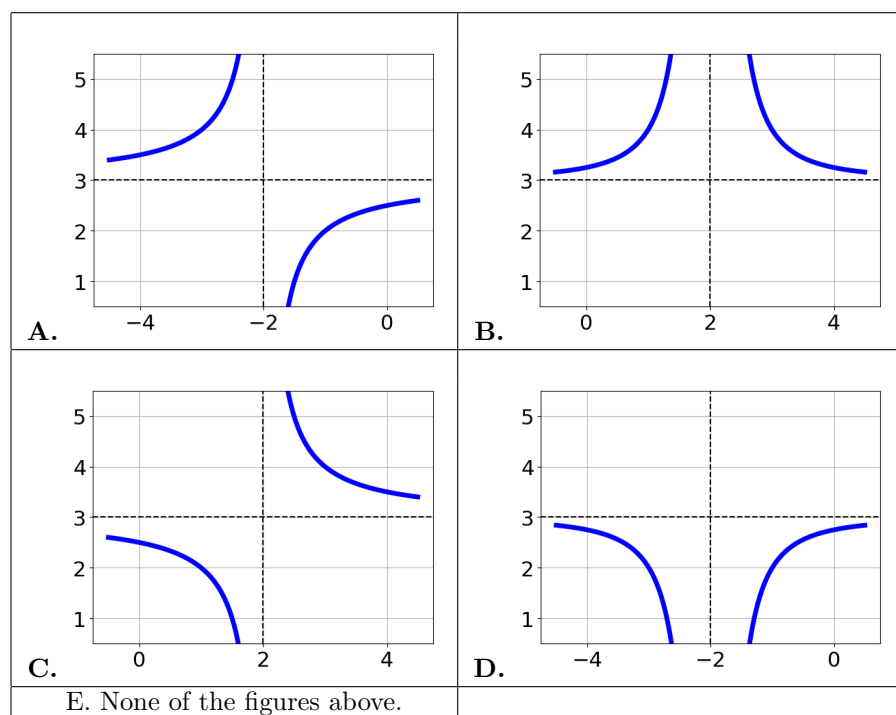
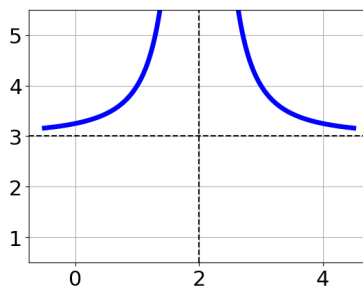
This corresponds to believing the vertex of the graph was not correct.

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. Choose the graph of the equation below.

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

The solution is



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.

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

$$\frac{-3x}{3x-3} + \frac{-6x^2}{12x^2-33x+21} = \frac{5}{4x-7}$$

The solution is There are two solutions: $x = 1.095$ and $x = -0.761$

A. $x \in [-0.8, 0.57]$

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

C. $x_1 \in [0.11, 1.74]$ and $x_2 \in [-5.9, 0.2]$

* $x = 1.095$ and $x = -0.761$, which is the correct option.

D. $x_1 \in [0.11, 1.74]$ and $x_2 \in [-0.3, 2.4]$

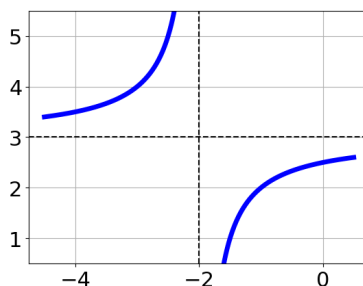
E. $x \in [1.58, 2.82]$

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!

31. Choose the graph of the equation below.

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

The solution is



<p>A.</p>	<p>B.</p>
<p>C.</p>	<p>D.</p>
<p>E. None of the figures above.</p>	

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.

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

$$\frac{5x}{6x-2} + \frac{-6x^2}{-24x^2+38x-10} = \frac{2}{-4x+5}$$

The solution is There are two solutions: $x = 0.715$ and $x = -0.215$

A. $x \in [1.15, 2.01]$

B. $x_1 \in [0.03, 1.17]$ and $x_2 \in [-2.17, 0.1]$

* $x = 0.715$ and $x = -0.215$, which is the correct option.

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

D. $x \in [-0.23, 0.12]$

E. $x_1 \in [0.03, 1.17]$ and $x_2 \in [0.13, 1.45]$

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!

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

$$\frac{-2}{-7x-6} + 5 = \frac{8}{-49x-42}$$

The solution is $x = -0.947$

A. $x \in [0.39, 0.83]$

$x = 0.767$, which corresponds to not distributing the factor $-7x - 6$ correctly when trying to eliminate the fraction.

B. $x_1 \in [-1.14, -0.72]$ and $x_2 \in [0, 1]$

$x = -0.947$ and $x = 0.767$, which corresponds to getting the correct solution and believing there should be a second solution to the equation.

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

This corresponds to thinking $x = -0.947$ leads to dividing by zero in the original equation, which it does not.

D. $x \in [-0.95, 0.05]$

* $x = -0.947$, which is the correct option.

E. $x_1 \in [-1.36, -1.01]$ and $x_2 \in [-2, 0]$

$x = -1.143$ and $x = -0.947$, 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!

34. Determine the domain of the function below.

$$f(x) = \frac{6}{20x^2 - 4x - 24}$$

The solution is All Real numbers except $x = -1.000$ and $x = 1.200$.

- A. All Real numbers except $x = a$, where $a \in [-3.4, 0.1]$

All Real numbers except $x = -1.000$, which corresponds to removing only 1 value from the denominator.

- B. All Real numbers except $x = a$ and $x = b$, where $a \in [-3.4, 0.1]$ and $b \in [0.3, 2]$

All Real numbers except $x = -1.000$ and $x = 1.200$, which is the correct option.

- C. All Real numbers.

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

- D. All Real numbers except $x = a$ and $x = b$, where $a \in [-17.5, -15.8]$ and $b \in [29.3, 30.4]$

All Real numbers except $x = -16.000$ and $x = 30.000$, which corresponds to not factoring the denominator correctly.

- E. All Real numbers except $x = a$, where $a \in [-17.5, -15.8]$

All Real numbers except $x = -16.000$, which corresponds to removing a distractor value from the denominator.

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