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.

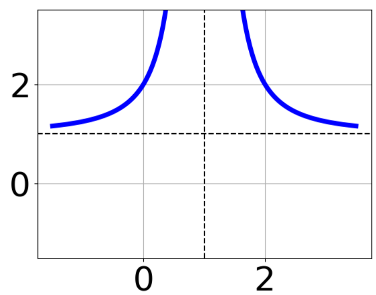
Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

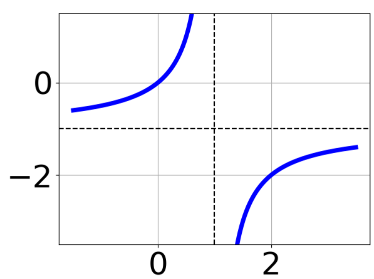
---

1. Choose the graph of the equation below.

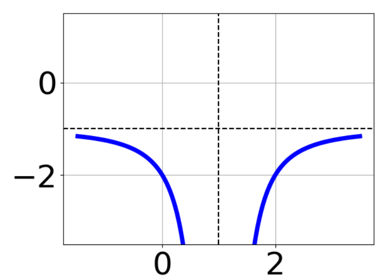
$$f(x) = \frac{1}{(x-1)^2} + 1$$

The solution is the graph below, which is option E.

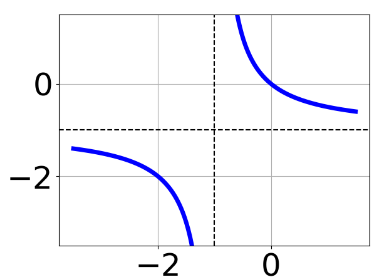




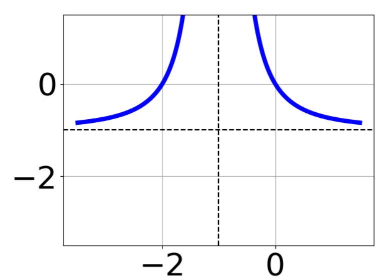
A.



C.



B.



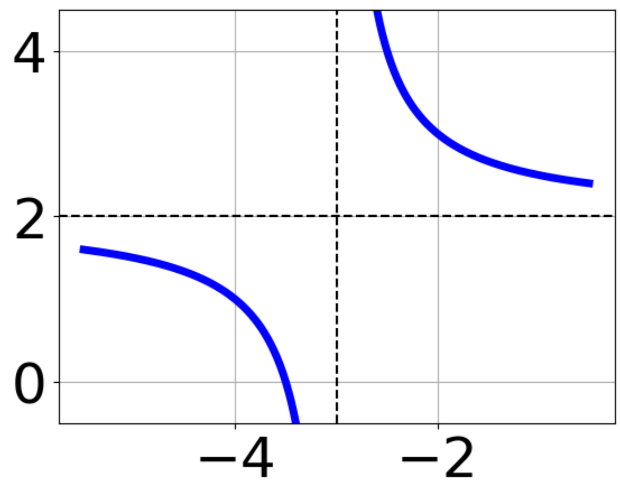
D.

E. None of the above.

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.

---

2. Choose the equation of the function graphed below.



The solution is None of the above as it should be $f(x) = \frac{1}{x+3} + 2$, which is option E.

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

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

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

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

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

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

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

Corresponds to thinking the graph was a shifted version of $\frac{1}{x^2}$ not noticing the y-value was wrong.

E. None of the above

None of the equation options were the correct equation.

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.

---

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

$$\frac{60}{-72x-60} + 1 = \frac{60}{-72x-60}$$

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

A. $x \in [0.4, 2.8]$

$x = 0.833$, which corresponds to not distributing the factor $-72x - 60$ correctly when trying to eliminate the fraction.

B. $x_1 \in [-1.5, -0.1]$ and $x_2 \in [-1.83, 0.17]$

$x = -0.833$ and $x = -0.833$, which corresponds to getting the correct solution and believing there should be a second solution to the equation.

C. $x_1 \in [-1.5, -0.1]$ and $x_2 \in [-0.17, 3.83]$

$x = -0.833$ and $x = 0.833$, which corresponds to getting the correct solution and believing there should be a second solution to the equation.

D. $x \in [-0.83, 0.17]$

$x = -0.833$, 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. All solutions lead to invalid or complex values in the equation.

*$x = -0.833$ 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!

---

4. Determine the domain of the function below.

$$f(x) = \frac{4}{20x^2 + x - 30}$$

The solution is All Real numbers except $x = -1.250$ and $x = 1.200.$, which is option B.

A. All Real numbers.

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

B. All Real numbers except $x = a$ and $x = b$, where $a \in [-4.25, -0.25]$ and $b \in [1.2, 2.2]$

All Real numbers except $x = -1.250$ and $x = 1.200$, which is the correct option.

C. All Real numbers except $x = a$ and $x = b$, where $a \in [-20, -17]$ and $b \in [30, 32]$

All Real numbers except $x = -20.000$ and $x = 30.000$, which corresponds to not factoring the denominator correctly.

D. All Real numbers except $x = a$, where $a \in [-20, -17]$

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

E. All Real numbers except $x = a$, where $a \in [-4.25, -0.25]$

All Real numbers except $x = -1.250$, 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.

---

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

$$\frac{6x}{5x-5} + \frac{-4x^2}{20x^2-35x+15} = \frac{-7}{4x-3}$$

The solution is There are two solutions: $x = 0.964$ and $x = -1.814$, which is option B.

A. $x \in [-1.83, -1.71]$

B. $x_1 \in [0.84, 1.05]$ and $x_2 \in [-4.81, 0.19]$

   * $x = 0.964$ and $x = -1.814$, which is the correct option.

C. $x_1 \in [0.84, 1.05]$ and $x_2 \in [-1, 4]$

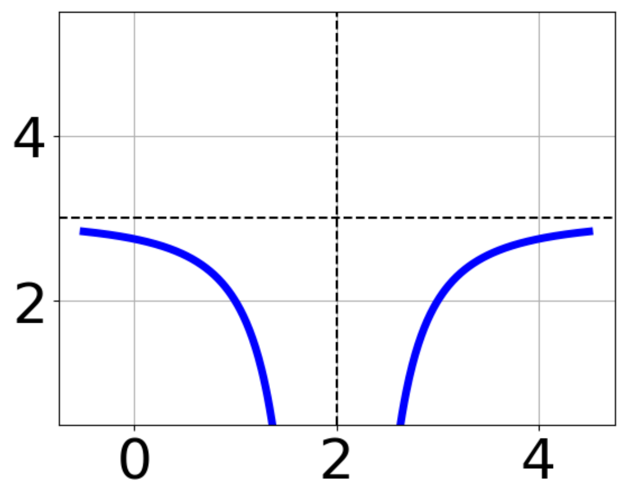
D. $x \in [0.7, 0.85]$

E. All solutions lead to invalid or complex values in 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!

---

6. Choose the equation of the function graphed below.



The solution is None of the above as it should be $f(x) = \frac{-1}{(x-2)^2} + 3$, which is option E.

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

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

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

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

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

   The x-value of the equation does not match the graph.

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

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

E. None of the above

None of the equation options were the correct equation.

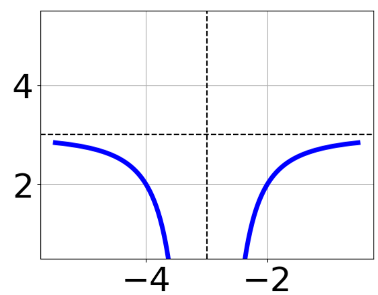
General Comment: Remember that the general form of a basic rational equation is $f(x) = \dfrac{a}{(x-h)^n} + k$, where a is the leading coefficient (and in this case, we assume is either 1 or -1), n is the degree (in this case, either 1 or 2), and (h, k) is the intersection of the asymptotes.

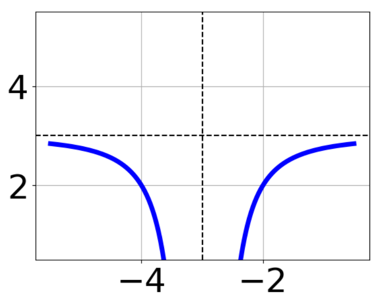
---

7. Choose the graph of the equation below.

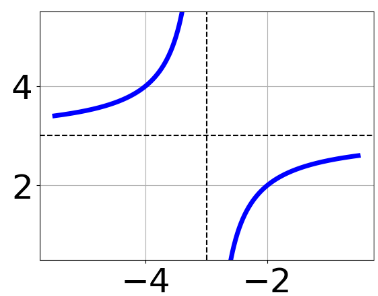
$$f(x) = \frac{-1}{(x+3)^2} + 3$$

The solution is the graph below, which is option A.

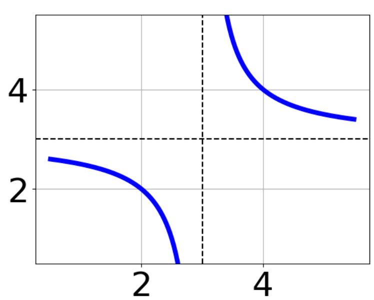




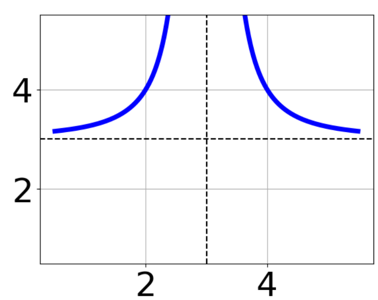
A.



C.



B.



D.

E. None of the above.

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.

---

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

$$\frac{9}{5x-8} + -5 = \frac{6}{-45x+72}$$

The solution is $x = 1.987$, which is option E.

A. $x_1 \in [-1.43, -0.9]$ and $x_2 \in [0.99, 4.99]$

$x = -1.213$ and $x = 1.987$, which corresponds to getting the correct solution and believing there should be a second solution to the equation.

B. $x \in [-1.43, -0.9]$

$x = -1.213$, which corresponds to not distributing the factor $5x - 8$ correctly when trying to eliminate the fraction.

C. $x_1 \in [1.62, 1.9]$ and $x_2 \in [0.99, 4.99]$

$x = 1.720$ and $x = 1.987$, which corresponds to getting the correct solution and believing there should be a second solution to the equation.

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

This corresponds to thinking $x = 1.987$ leads to dividing by zero in the original equation, which it does not.

E. $x \in [1.99, 2.99]$

* $x = 1.987$, 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!

---

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

$$\frac{2x}{3x+5} + \frac{-7x^2}{12x^2+29x+15} = \frac{4}{4x+3}$$

The solution is There are two solutions: $x = -2.385$ and $x = 8.385$, which is option C.

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

B. $x \in [7.7, 9.8]$

C. $x_1 \in [-3.1, -1.3]$ and $x_2 \in [6.38, 9.38]$

* $x = -2.385$ and $x = 8.385$, which is the correct option.

D. $x \in [-2.1, 3.3]$

E. $x_1 \in [-3.1, -1.3]$ and $x_2 \in [-7.67, -0.67]$

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!

---

10. Determine the domain of the function below.

$$f(x) = \frac{6}{24x^2 - 48x + 18}$$

The solution is All Real numbers except $x = 0.500$ and $x = 1.500$., which is option B.

A. All Real numbers except $x = a,$ where $a \in [17, 18.3]$

All Real numbers except $x = 18.000$, which corresponds to removing a distractor value from the denominator.

B. All Real numbers except $x = a$ and $x = b,$ where $a \in [-0.1, 0.8]$ and $b \in [1, 2.2]$

All Real numbers except $x = 0.500$ and $x = 1.500$, which is the correct option.

C. All Real numbers except $x = a,$ where $a \in [-0.1, 0.8]$

All Real numbers except $x = 0.500$, which corresponds to removing only 1 value from the denominator.

D. All Real numbers except $x = a$ and $x = b,$ where $a \in [17, 18.3]$ and $b \in [23.8, 25.4]$

All Real numbers except $x = 18.000$ and $x = 24.000$, which corresponds to not factoring the denominator correctly.

E. All Real numbers.

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

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.