Point of Discontinuity Practice

Use the following information to answer the first question.

Consider the following rational equations.

I	II
$y = \frac{(x+9)}{(x-9)}$	$y = \frac{(x+3)(x-12)}{(x-5)(x-12)}$
III	**IV**
$y = \frac{x(2x-3)}{x}$	$y = \frac{(x+5)(x-10)}{(x-1)(x+4)}$

1. The two equations having a point of discontinuity are

   A) I and II B) III and IV C) I and IV D) II and III

2. The y-coordinate of the point of discontinuity for $y = \frac{(x+6)(x-9)}{3(x-9)}$ is _____.

3. The point of discontinuity for $y = \frac{x^2-49}{4x-28}$ is

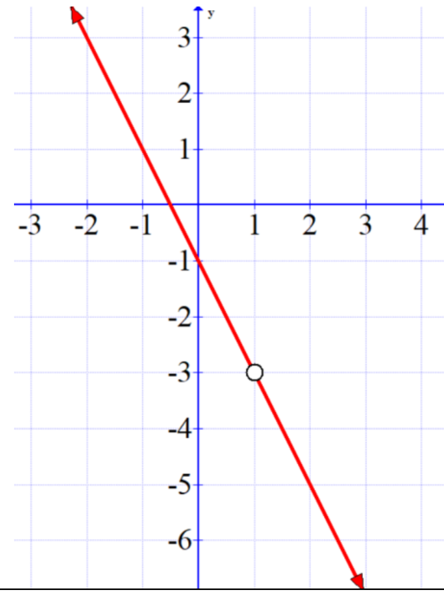
   A) (7, 3.5) B) (7, 3) C) (-7, 3.5) D) (-7, -3)

4. The x-coordinate for the point of discontinuity of $y = \frac{4m(x-k)}{(x-k)}$ is

   A) M
   B) K
   C) 4
   D) 0

Use the following information to answer the next question.

Consider the graph below.



5. The equation to represent this graph would be

A) y = -(2x +1)
B) y = -(2x – 1)
C) $y = \frac{-(2x+1)(x-1)}{(x-1)}$
D) $y = \frac{-(2x-1)(x-1)}{(x-1)}$

6. The point of discontinuity is (3,2) for the rational equation $y = \frac{(x-3)(x+K)}{(x-3)(x+1)}$. The value of K is _____.

7. Given the equation $y = \frac{x^2-6x-16}{x^2-10x+16}$, the point of discontinuity is in quadrant

A) 1　　B) 2　　C) 3　　D) 4

8. Explain why $y = \frac{2(x+6)(x-1)}{-5(x-3)}$ does not have a point of discontinuity.

9. The point of discontinuity for $y = \frac{(x+c)(4x-c)}{mx+mc}$ expressed in terms of m and c is

A) $\left(c, -\frac{5c}{m}\right)$ B) $\left(-c, -\frac{5c}{m}\right)$ C) $\left(c, -\frac{3c}{m}\right)$ D) $\left(-c, -\frac{3c}{m}\right)$

10. The point of discontinuity for $y = \frac{2x^2+x-1}{4x^2-1}$ is

A) $\left(\frac{1}{2}, \frac{3}{4}\right)$ B) $\left(\frac{1}{2}, \frac{4}{3}\right)$ C) $\left(-\frac{1}{2}, \frac{3}{4}\right)$ D) $\left(-\frac{1}{2}, \frac{4}{3}\right)$

Point of Discontinuity Practice Solutions

Use the following information to answer the first question.

Consider the following rational equations.

I	II
$y = \frac{(x+9)}{(x-9)}$	$y = \frac{(x+3)(x-12)}{(x-5)(x-12)}$
III	**IV**
$y = \frac{x(2x-3)}{x}$	$y = \frac{(x+5)(x-10)}{(x-1)(x+4)}$

1. The two equations having a point of discontinuity are

A) I and II B) III and IV C) I and IV D) II and III

Solution

When there is a point of discontinuity, there would be a common zero in the numerator and the denominator. In other words, there would be a factor (usually a binomial or a monomial) common to both the numerator and the denominator.

For equation II, there is a common binomial factor of (x – 12). For equation III, there is a common monomial factor of x. There are no common factors in either I or IV.

The correct answer is D.

2. The y-coordinate of the point of discontinuity for $y = \frac{(x+6)(x-9)}{3(x-9)}$ is _5_.

Solution

The common binomial factor is (x – 9), and thus there is a common zero of 9. After dividing out this common factor, the simplification is $y = \frac{x+6}{3}$. Since x ≠ 9 in the original equation, x ≠ 9 in the simplified version.

To find the y-coordinate, set x = 9 in the equation $y = \frac{x+6}{3}$.

$$y = \frac{(9) + 6}{3} = 5$$

The y-coordinate for the point of discontinuity is 5.

3. The point of discontinuity for $y = \frac{x^2-49}{4x-28}$ is

   A) (7, 3.5) B) (7, 3) C) (-7, 3.5) D) (-7, -3)

Solution

This question requires factoring in both the numerator and the denominator.

$$y = \frac{x^2 - 49}{4x - 28}$$

$$y = \frac{(x - 7)(x + 7)}{4(x - 7)}$$

We know that x ≠ 7.

The simplification is $y = \frac{x+7}{4}$.

Substitute x = 7.

$$y = \frac{(7) + 7}{4}$$

$y = \frac{14}{4} = 3.5$

The point of discontinuity is (7, 3.5).

The correct answer is A.

4. The x-coordinate for the point of discontinuity of $y = \frac{4m(x-k)}{(x-k)}$ is

   A) M
   B) K
   C) 4
   D) 0

Solution

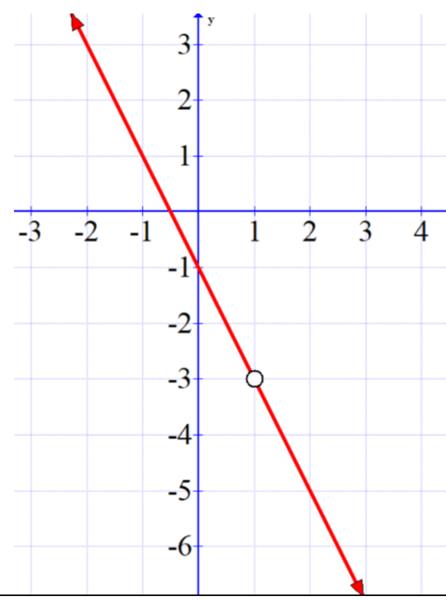
We know that (x – k) cannot be equal to zero. For example, if k = 5, then x ≠ 5.

If x = k, then k is a non-permissible value, which would make it the x-coordinate of the point of discontinuity.

The correct answer is B.

Use the following information to answer the next question.

Consider the graph below.



5. The equation to represent this graph would be

   A) y = -(2x +1)
   B) y = -(2x – 1)
   C) $y = \frac{-(2x+1)(x-1)}{(x-1)}$
   D) $y = \frac{-(2x-1)(x-1)}{(x-1)}$

Solution

There is a point of discontinuity at (1,-3). We know that x = 1 is a non-permissible value and as such, there is a common binomial of (x – 1) in the numerator and the denominator. Our answer must be C or D.

The simplified equation is either:

y = -(2x + 1) or y = -(2x – 1)

Which of these two equations results is a y coordinate of -3, when x = 1 is substituted for the variable?

y = -(2(1) + 1) or y = -(2(1) – 1)

y = -(3) or y = -(1)

The correct simplified version is y = -(2x + 1).

An alternative approach would be to notice from the graph, the slope is -2 and the y-intercept is -1. This information corresponds to y = -(2x + 1).

The correct answer is C.

6. The point of discontinuity is (3,2) for the rational equation $y = \frac{(x-3)(x+K)}{(x-3)(x+1)}$.

   The value of K is _5_.

Solution

Once the common binomial of (x – 3) is divided out of the numerator and the denominator, the simplified equation is $y = \frac{x+K}{x+1}$.

Substitute the point (3,2) and solve for K.

$$2 = \frac{(3) + K}{(3) + 1}$$

$$2 = \frac{3 + K}{4}$$

8 = 3 + K

K = 5

7. Given the equation $y = \frac{x^2-6x-16}{x^2-10x+16}$, the point of discontinuity is in quadrant

A) 1 B) 2 C) 3 D) 4

Solution

Factor the numerator and the denominator.

$$y = \frac{(x-8)(x+2)}{(x-8)(x-2)}$$

This equation simplifies to $y = \frac{(x+2)}{(x-2)}$, where x ≠ 8.

Substitute x = 8 to find y.

$$y = \frac{(8)+2}{(8)-2} = \frac{10}{6} = \frac{5}{3}$$

The point of discontinuity is $\left(8, \frac{5}{3}\right)$. This point is in quadrant 1.

The correct answer is A.

8. Explain why $y = \frac{2(x+6)(x-1)}{-5(x-3)}$ does not have a point of discontinuity.

Solution

There is no common monomial or binomial common factor in the numerator and the denominator. In other words, there is no common zero in the numerator and the denominator.

9. The point of discontinuity for $y = \frac{(x+c)(4x-c)}{mx+mc}$ expressed in terms of m and c is

$A)$ $\left(c, -\frac{5c}{m}\right)$ B) $\left(-c, -\frac{5c}{m}\right)$ C) $\left(c, -\frac{3c}{m}\right)$ D) $\left(-c, -\frac{3c}{m}\right)$

Solution

Factor the denominator.

$$y = \frac{(x + c)(4x - c)}{mx + mc}$$

$$y = \frac{(x + c)(4x - c)}{m(x + c)}$$

x ≠ -c

After dividing out the common binomial factor (x + c), the simplification is

$$y = \frac{(4x - c)}{m}$$

Substitute -c for x.

$$y = \frac{(4(-c) - c)}{m}$$

$$y = \frac{-5c}{m}$$

The correct answer is B.

10. The point of discontinuity for $y = \frac{2x^2+x-1}{4x^2-1}$ is

$A)\ \left(\frac{1}{2}, \frac{3}{4}\right)$ B) $\left(\frac{1}{2}, \frac{4}{3}\right)$ C) $\left(-\frac{1}{2}, \frac{3}{4}\right)$ D) $\left(-\frac{1}{2}, \frac{4}{3}\right)$

Solution

Factor the numerator and the denominator.

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

Since we will simplify the equation by dividing out the common binomial factor of (2x – 1), we know that the simplified equation cannot have a value of x = ½.

The simplified equation is $y = \frac{(x+1)}{(2x+1)}$.

Substitute x = ½ to find the y-coordinate.

$$y = \frac{\left(\left(\frac{1}{2}\right) + 1\right)}{\left(2\left(\frac{1}{2}\right) + 1\right)}$$

$$y = \frac{\left(\frac{3}{2}\right)}{(2)}$$

$$y = \left(\frac{3}{2}\right)\left(\frac{1}{2}\right) = \frac{3}{4}$$

The correct answer is A.