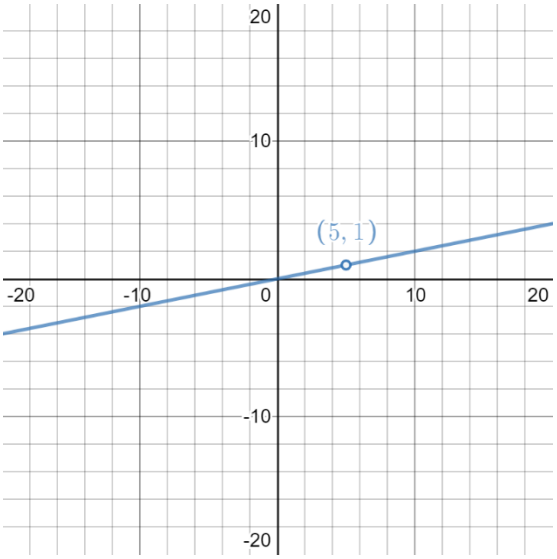
Section 1.3 Continuity

#1-10: Find all values of x = a where the function is discontinuous. State the first reason that makes the function discontinuous for the value of $x = a$.

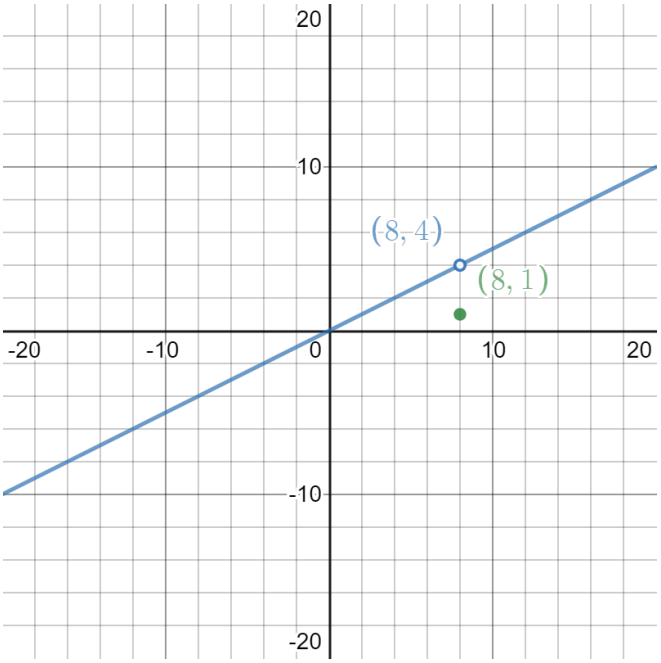
1)



$x = 5$

Reason 1 since function is not defined at x =5 (no solid circle at x = 5).

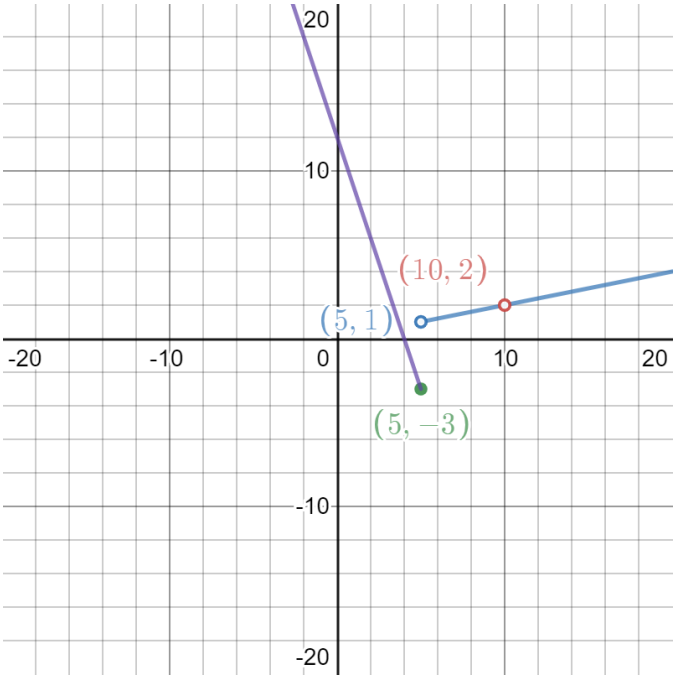
3)



$x = 8$

Reason 3: limit exists, value of the limit is y = 4 but the function value is y = 1

5)



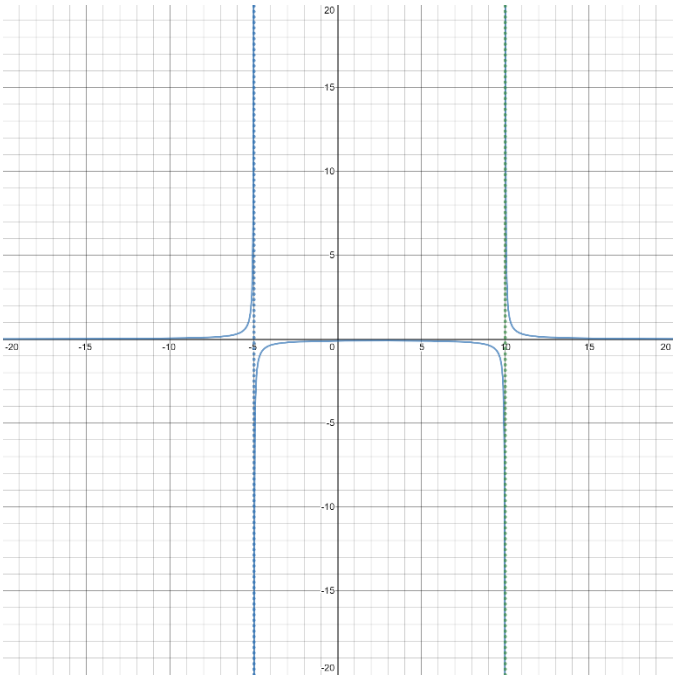
$x = 5$

Reason 2: limit does not exist, graph goes in and out different points.

$x = 10$

Reason 1: Function is not defined as there is no point marked with a solid circle with x = 10.

7)



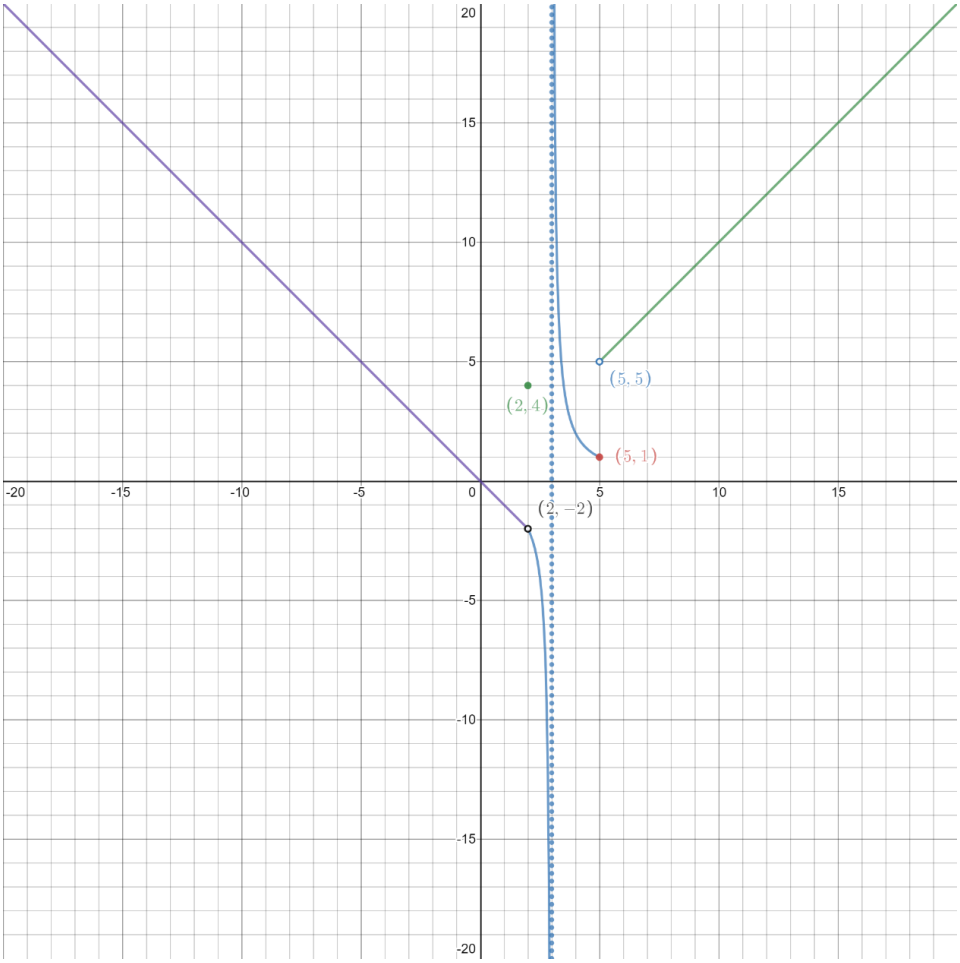
$x = -5$

Reason 1 as there is a vertical asymptote at the value of $x = -5$.

$x = 10$

Reason 1 as here is a vertical asymptote at the value of $x = 10$.

9)



$x = 2$

Reason 3: limit exists but the limit value is y = -2 and the function value is y = 4

$x = 3$

Reason 1 as there is a vertical asymptote at the value of $x = 3$.

$x = 5$

Reason 2 as the limit does not exist since the graph goes in from one point and out another

is continuous everywhere. You do not need to state the reason the function is discontinuous.

11) $f(x) = \frac{x-3}{x+4}$

$$x + 4 = 0$$
$$x = -4$$

Answer:

$$x = -4$$

13) $f(x) = \frac{x^2+7x+12}{x+3}$

$$x + 3 = 0$$

$$x = -3$$

Answer:

$$x = -3$$

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

$x + 2 = 0$

$x = -2$

Answer $x = -2$

17) $f(x) = \frac{5}{x^2+3x+2}$

$$x^2 + 3x + 2 = 0$$
$$(x + 1)(x + 2) = 0$$
$$x = -1,\ x = -2$$

Answer:

$x = -2$ and $x = -1$

19) $f(x) = 2x - 6$

Answer:

The function is continuous everywhere because it is a polynomial.

21) $f(x) = x^2 + 6x - 7$

Answer:

The function is continuous everywhere because it is a polynomial.

23) $f(x) = \begin{cases} x + 3, \ if \ x \leq 6 \\ 2x, \ if \ x > 6 \end{cases}$

Top function: $f(6) = 6 + 3 = 9$

Bottom function: $f(6) = 2 * 6 = 12$

Answer:

$x = 6$ (since the values are not equal)

25) $f(x) = \begin{cases} x - 3, \ if \ x \leq 5 \\ 2x - 9, \ if \ x > 5 \end{cases}$

Top function: $f(5) = 5 - 3 = 2$

Bottom function: $f(5) = 2(5) - 9 = 1$

Answer:

$x = 5$ (since values not equal)

27) $f(x) = \begin{cases} x + 6, & if\ x \leq 6 \\ 2x, & if\ x > 6 \end{cases}$

Top function: $f(6) = 6 + 6 = 12$

Bottom function: $f(6) = 2(6) = 12$

Answer:

Continuous everywhere, (both values are the same, and each piece is a polynomial)

29) $f(x) = \begin{cases} x - 3, \ if \ x \leq 5 \\ 2x - 8, \ if \ x > 5 \end{cases}$

Top function: $f(5) = 5 - 3 = 2$

Bottom function: $f(5) = 2(5) - 8 = 2$

Answer:

Continuous everywhere, (both values are the same, and each piece is a polynomial)