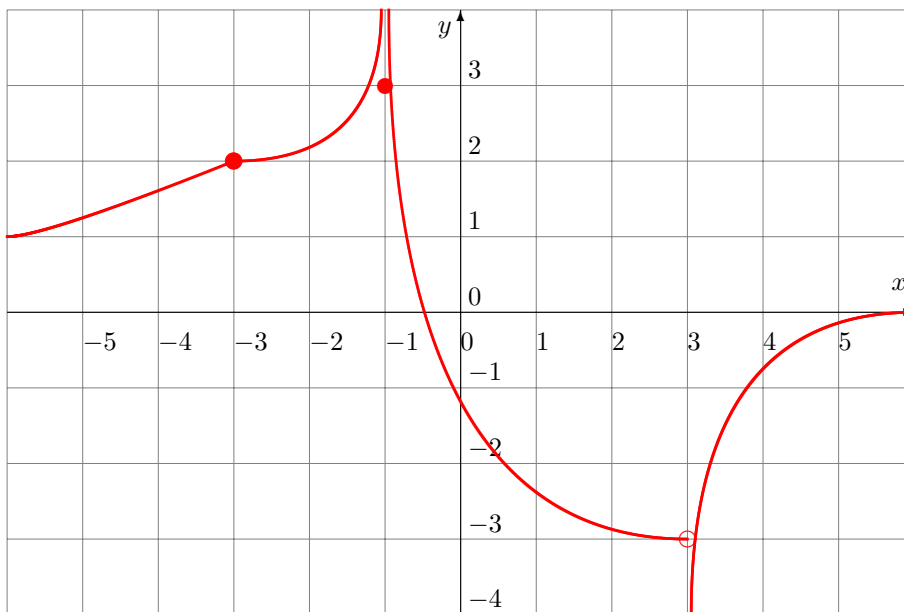


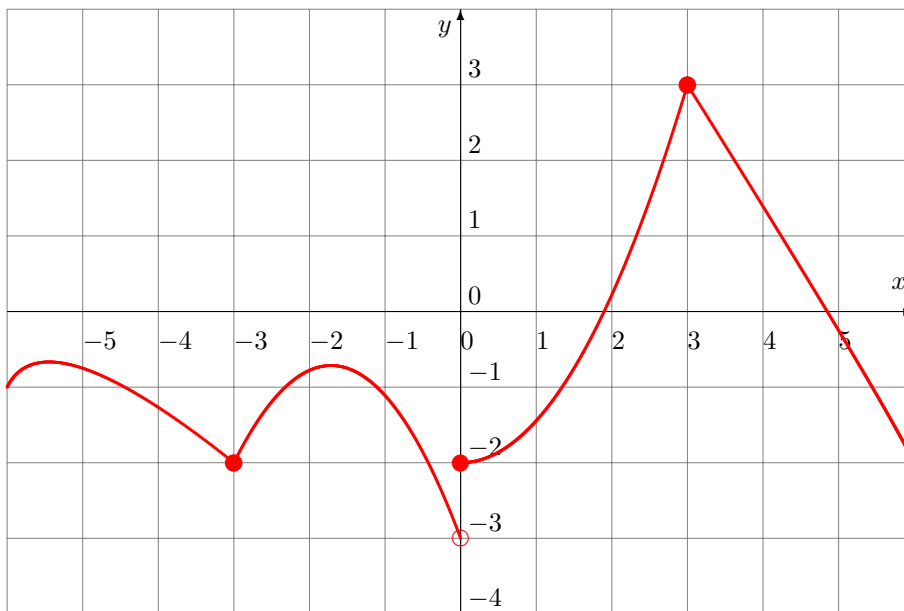
1. Consider the following function defined by its graph:



Analyze the discontinuity of this function (continuous or discontinuous) and the type of discontinuity (removable, jump or infinite discontinuity) at the following numbers:

- a) $x = -3$ b) $x = -1$ c) $x = 3$

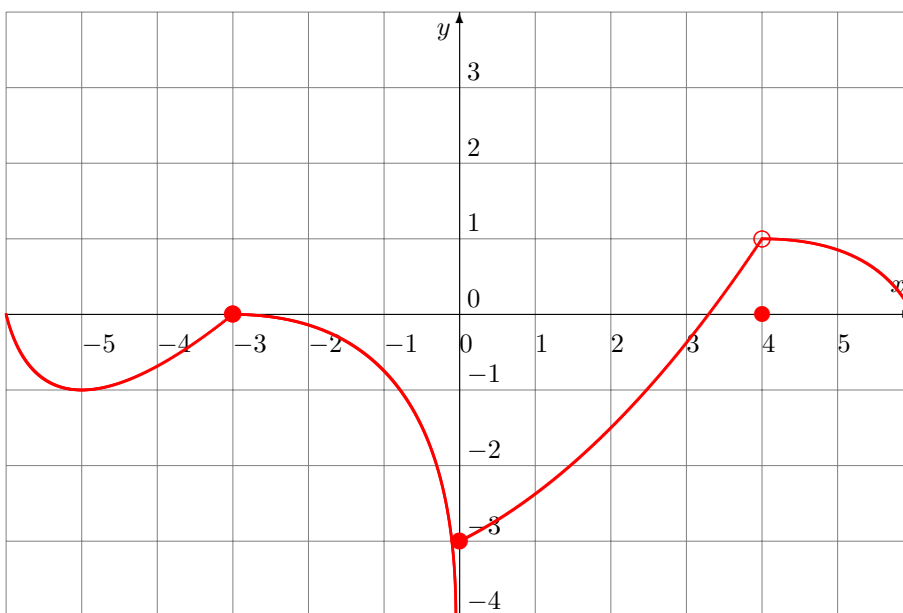
2. Consider the following function defined by its graph:



Analyze the discontinuity of this function (continuous or discontinuous) and the type of discontinuity (removable, jump or infinite discontinuity) at the following numbers:

- a) $x = -3$ b) $x = 0$ c) $x = 3$

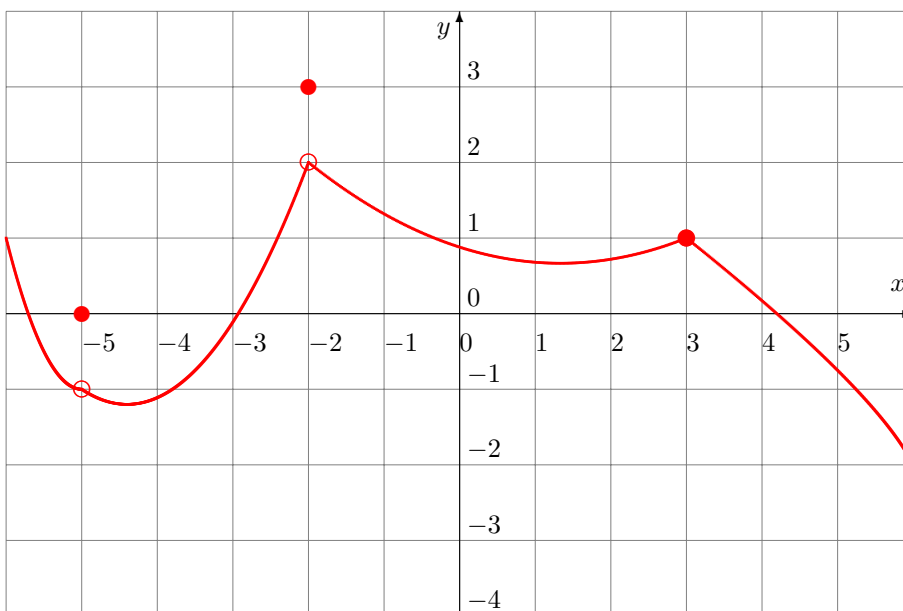
3. Consider the following function defined by its graph:



Analyze the discontinuity of this function (continuous or discontinuous) and the type of discontinuity (removable, jump or infinite discontinuity) at the following numbers:

- a) $x = -3$ b) $x = 0$ c) $x = 4$

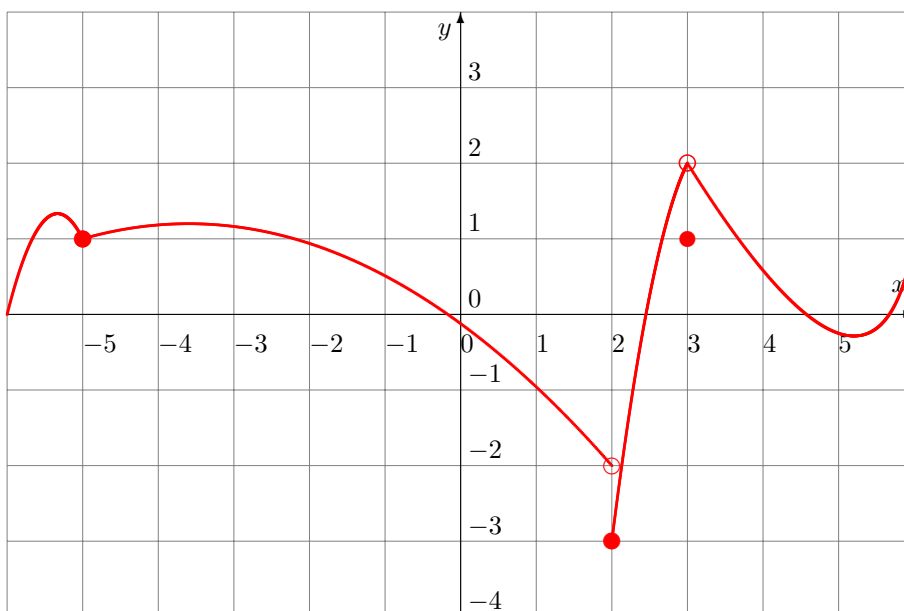
4. Consider the following function defined by its graph:



Analyze the discontinuity of this function (continuous or discontinuous) and the type of discontinuity (removable, jump or infinite discontinuity) at the following numbers:

- a) $x = -5$ b) $x = -2$ c) $x = 3$

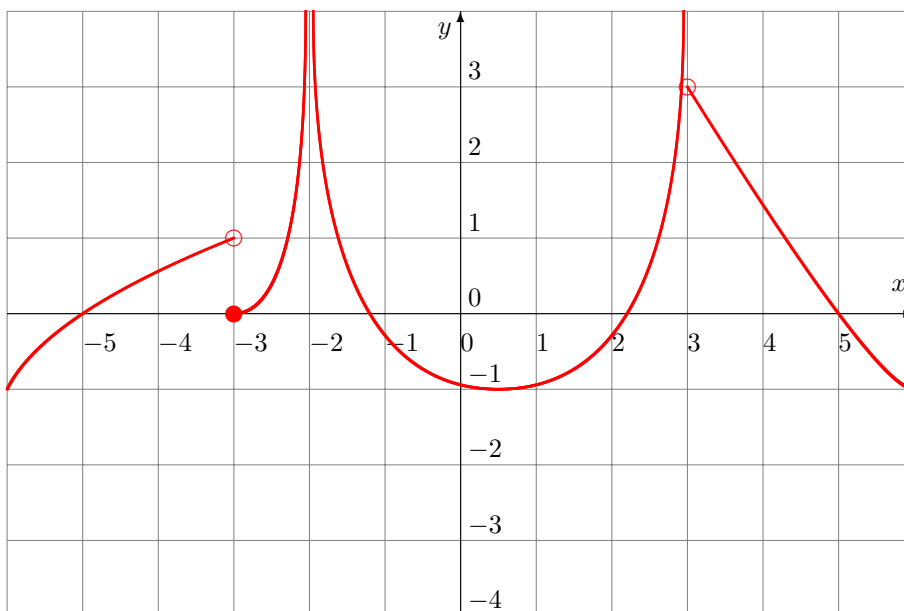
5. Consider the following function defined by its graph:



Analyze the discontinuity of this function (continuous or discontinuous) and the type of discontinuity (removable, jump or infinite discontinuity) at the following numbers:

- a) $x = -5$ b) $x = 2$ c) $x = 3$

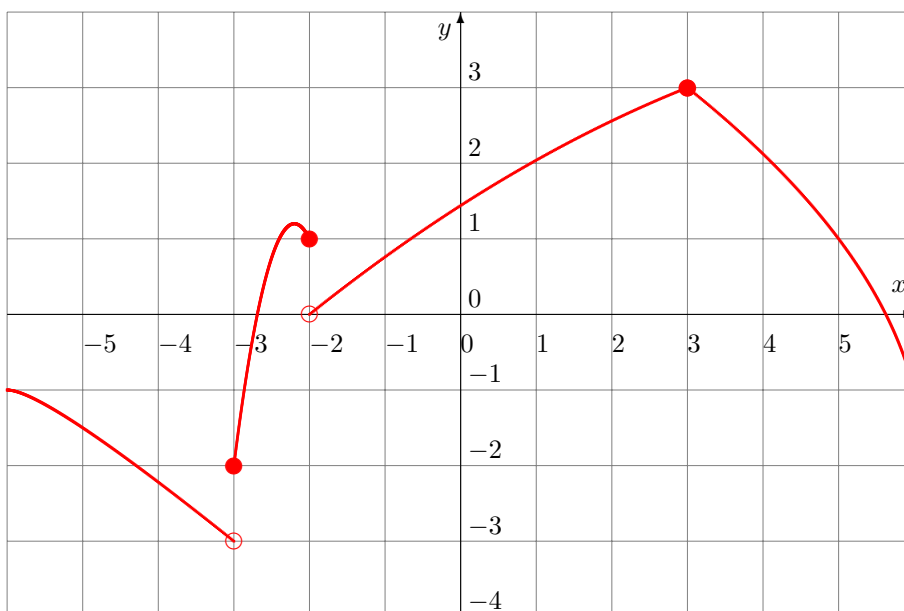
6. Consider the following function defined by its graph:



Analyze the discontinuity of this function (continuous or discontinuous) and the type of discontinuity (removable, jump or infinite discontinuity) at the following numbers:

- a) $x = -3$ b) $x = -2$ c) $x = 3$

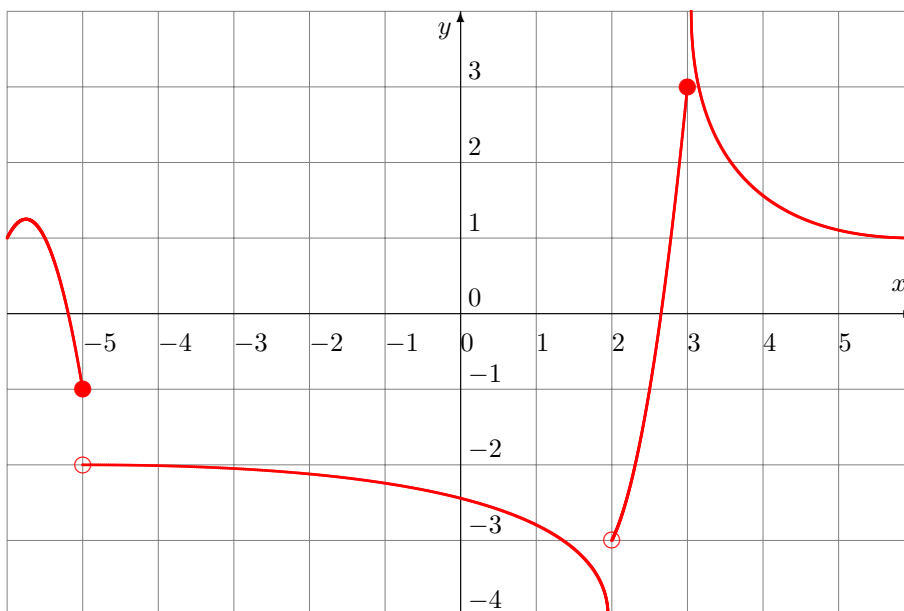
7. Consider the following function defined by its graph:



Analyze the discontinuity of this function (continuous or discontinuous) and the type of discontinuity (removable, jump or infinite discontinuity) at the following numbers:

- a) $x = -3$ b) $x = -2$ c) $x = 3$

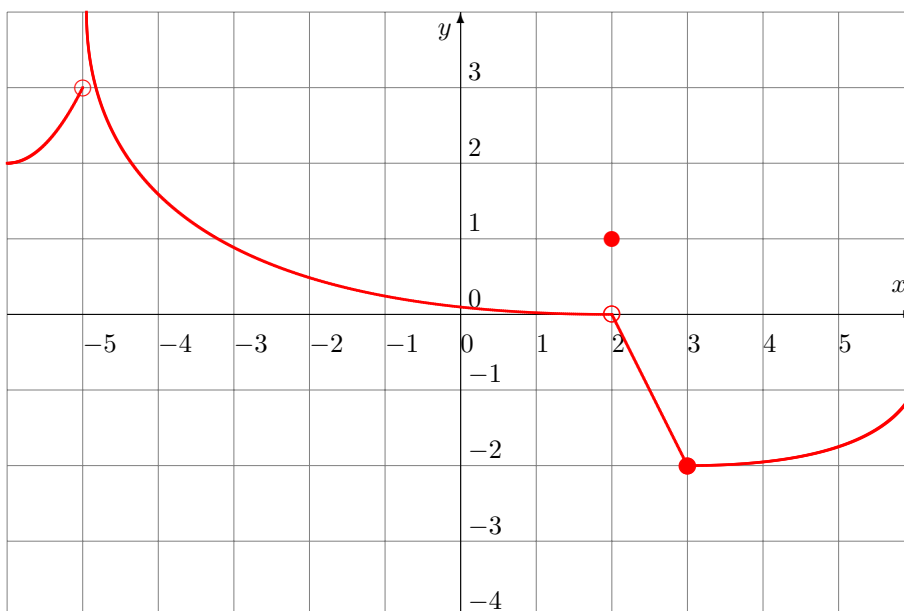
8. Consider the following function defined by its graph:



Analyze the discontinuity of this function (continuous or discontinuous) and the type of discontinuity (removable, jump or infinite discontinuity) at the following numbers:

- a) $x = -5$ b) $x = 2$ c) $x = 3$

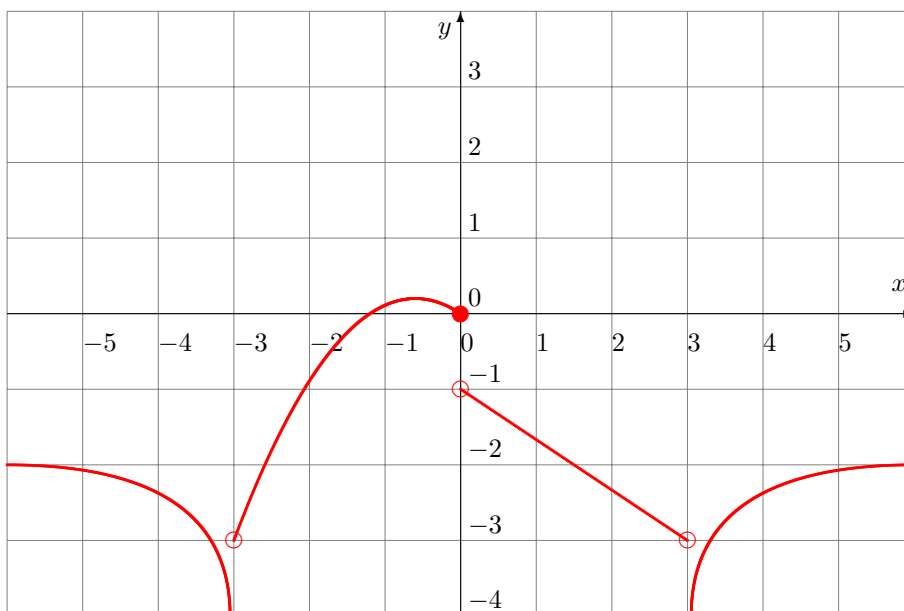
9. Consider the following function defined by its graph:



Analyze the discontinuity of this function (continuous or discontinuous) and the type of discontinuity (removable, jump or infinite discontinuity) at the following numbers:

- a) $x = -5$ b) $x = 2$ c) $x = 3$

10. Consider the following function defined by its graph:



Analyze the discontinuity of this function (continuous or discontinuous) and the type of discontinuity (removable, jump or infinite discontinuity) at the following numbers:

- a) $x = -3$ b) $x = 0$ c) $x = 3$

- Answers: 1. a) continuous b) discontinuous (infinite discontinuity) c) discontinuous (infinite discontinuity)
 2. a) continuous b) discontinuous (jump discontinuity) c) continuous
 3. a) continuous b) discontinuous (infinite discontinuity) c) discontinuous (removable discontinuity)
 4. a) discontinuous (removable discontinuity) b) discontinuous (removable discontinuity) c) continuous
 5. a) continuous b) discontinuous (jump discontinuity) c) discontinuous (removable discontinuity)
 6. a) discontinuous (jump discontinuity) b) discontinuous (infinite discontinuity) c) discontinuous (infinite discontinuity)
 7. a) discontinuous (jump discontinuity) b) discontinuous (jump discontinuity) c) continuous
 8. a) discontinuous (jump discontinuity) b) discontinuous (infinite discontinuity) c) continuous
 9. a) discontinuous (infinite discontinuity) b) discontinuous (removable discontinuity) c) discontinuous (infinite discontinuity)
 10. a) discontinuous (infinite discontinuity) b) discontinuous (jump discontinuity) c) discontinuous (infinite discontinuity)

Solutions:

1.

$$a) \lim_{x \rightarrow -3^-} f(x) = 2 \quad \lim_{x \rightarrow -3^+} f(x) = 2 \quad f(-3) = 2$$

Therefore the function is continuous.

$$b) \lim_{x \rightarrow -1^-} f(x) = \infty \quad \lim_{x \rightarrow -1^+} f(x) = \infty \quad f(-1) = 3$$

Therefore the function is discontinuous. There is an infinite discontinuity.

$$c) \lim_{x \rightarrow 3^-} f(x) = -3 \quad \lim_{x \rightarrow 3^+} f(x) = -\infty \quad f(3) = DNE$$

Therefore the function is discontinuous. There is an infinite discontinuity.

2.

$$a) \lim_{x \rightarrow -3^-} f(x) = -2 \quad \lim_{x \rightarrow -3^+} f(x) = -2 \quad f(-3) = -2$$

Therefore the function is continuous.

$$b) \lim_{x \rightarrow 0^-} f(x) = -3 \quad \lim_{x \rightarrow 0^+} f(x) = -2 \quad f(0) = -2 \quad \lim_{x \rightarrow 0^-} f(x) \neq \lim_{x \rightarrow 0^+} f(x)$$

Therefore the function is discontinuous. There is a jump discontinuity.

$$c) \lim_{x \rightarrow 3^-} f(x) = 3 \quad \lim_{x \rightarrow 3^+} f(x) = 3 \quad f(3) = 3$$

Therefore the function is continuous.

3.

$$a) \lim_{x \rightarrow -3^-} f(x) = 0 \quad \lim_{x \rightarrow -3^+} f(x) = 0 \quad f(-3) = 0$$

Therefore the function is continuous.

$$b) \lim_{x \rightarrow 0^-} f(x) = -\infty \quad \lim_{x \rightarrow 0^+} f(x) = -3 \quad f(0) = -3$$

Therefore the function is discontinuous. There is an infinite discontinuity.

$$c) \lim_{x \rightarrow 4^-} f(x) = 1 \quad \lim_{x \rightarrow 4^+} f(x) = 1 \quad f(4) = 0 \quad \lim_{x \rightarrow 4^-} f(x) \neq f(4) \quad \lim_{x \rightarrow 4^+} f(x) \neq f(4)$$

Therefore the function is discontinuous. There is a removable discontinuity.

4.

$$a) \lim_{x \rightarrow -5^-} f(x) = -1 \quad \lim_{x \rightarrow -5^+} f(x) = -1 \quad f(-5) = 0 \quad \lim_{x \rightarrow -5^-} f(x) \neq f(-5) \quad \lim_{x \rightarrow -5^+} f(x) \neq f(-5)$$

Therefore the function is discontinuous. There is a removable discontinuity.

$$b) \lim_{x \rightarrow -2^-} f(x) = 2 \quad \lim_{x \rightarrow -2^+} f(x) = 2 \quad f(-2) = 3 \quad \lim_{x \rightarrow -2^-} f(x) \neq f(-2) \quad \lim_{x \rightarrow -2^+} f(x) \neq f(-2)$$

Therefore the function is discontinuous. There is a removable discontinuity.

$$c) \lim_{x \rightarrow 3^-} f(x) = 1 \quad \lim_{x \rightarrow 3^+} f(x) = 1 \quad f(3) = 1$$

Therefore the function is continuous.

5.

$$a) \lim_{x \rightarrow -5^-} f(x) = 1 \quad \lim_{x \rightarrow -5^+} f(x) = 1 \quad f(-5) = 1$$

Therefore the function is continuous.

$$b) \lim_{x \rightarrow 2^-} f(x) = -2 \quad \lim_{x \rightarrow 2^+} f(x) = -3 \quad f(2) = -3 \quad \lim_{x \rightarrow 2^-} f(x) \neq \lim_{x \rightarrow 2^+} f(x)$$

Therefore the function is discontinuous. There is a jump discontinuity.

$$c) \lim_{x \rightarrow 3^-} f(x) = 2 \quad \lim_{x \rightarrow 3^+} f(x) = 2 \quad f(3) = 1 \quad \lim_{x \rightarrow 3^-} f(x) \neq f(3) \quad \lim_{x \rightarrow 3^+} f(x) \neq f(3)$$

Therefore the function is discontinuous. There is a removable discontinuity.

6.

$$a) \lim_{x \rightarrow -3^-} f(x) = 1 \quad \lim_{x \rightarrow -3^+} f(x) = 0 \quad f(-3) = 0 \quad \lim_{x \rightarrow -3^-} f(x) \neq \lim_{x \rightarrow -3^+} f(x)$$

Therefore the function is discontinuous. There is a jump discontinuity.

$$b) \lim_{x \rightarrow -2^-} f(x) = \infty \quad \lim_{x \rightarrow -2^+} f(x) = \infty \quad f(-2) = DNE$$

Therefore the function is discontinuous. There is an infinite discontinuity.

$$c) \lim_{x \rightarrow 3^-} f(x) = \infty \quad \lim_{x \rightarrow 3^+} f(x) = 3 \quad f(3) = DNE$$

Therefore the function is discontinuous. There is an infinite discontinuity.

7.

$$\text{a) } \lim_{x \rightarrow -3^-} f(x) = -3 \quad \lim_{x \rightarrow -3^+} f(x) = -2 \quad f(-3) = -2 \quad \lim_{x \rightarrow -3^-} f(x) \neq \lim_{x \rightarrow -3^+} f(x)$$

Therefore the function is discontinuous. There is a jump discontinuity.

$$\text{b) } \lim_{x \rightarrow -2^-} f(x) = 1 \quad \lim_{x \rightarrow -2^+} f(x) = 0 \quad f(-2) = 1 \quad \lim_{x \rightarrow -2^-} f(x) \neq \lim_{x \rightarrow -2^+} f(x)$$

Therefore the function is discontinuous. There is a jump discontinuity.

$$\text{c) } \lim_{x \rightarrow 3^-} f(x) = 3 \quad \lim_{x \rightarrow 3^+} f(x) = 3 \quad f(3) = 3$$

Therefore the function is continuous.

8.

$$\text{a) } \lim_{x \rightarrow -5^-} f(x) = -1 \quad \lim_{x \rightarrow -5^+} f(x) = -2 \quad f(-5) = -1 \quad \lim_{x \rightarrow -5^-} f(x) \neq \lim_{x \rightarrow -5^+} f(x)$$

Therefore the function is discontinuous. There is a jump discontinuity.

$$\text{b) } \lim_{x \rightarrow 2^-} f(x) = -\infty \quad \lim_{x \rightarrow 2^+} f(x) = -3 \quad f(2) = DNE$$

Therefore the function is discontinuous. There is an infinite discontinuity.

$$\text{c) } \lim_{x \rightarrow 3^-} f(x) = 3 \quad \lim_{x \rightarrow 3^+} f(x) = \infty \quad f(3) = 3$$

Therefore the function is discontinuous. There is an infinite discontinuity.

9.

$$\text{a) } \lim_{x \rightarrow -5^-} f(x) = 3 \quad \lim_{x \rightarrow -5^+} f(x) = \infty \quad f(-5) = DNE$$

Therefore the function is discontinuous. There is an infinite discontinuity.

$$\text{b) } \lim_{x \rightarrow 2^-} f(x) = 0 \quad \lim_{x \rightarrow 2^+} f(x) = 0 \quad f(2) = 1 \quad \lim_{x \rightarrow 2^-} f(x) \neq f(2) \quad \lim_{x \rightarrow 2^+} f(x) \neq f(2)$$

Therefore the function is discontinuous. There is a removable discontinuity.

$$\text{c) } \lim_{x \rightarrow 3^-} f(x) = -2 \quad \lim_{x \rightarrow 3^+} f(x) = -2 \quad f(3) = -2$$

Therefore the function is continuous.

10.

$$\text{a) } \lim_{x \rightarrow -3^-} f(x) = -\infty \quad \lim_{x \rightarrow -3^+} f(x) = -3 \quad f(-3) = DNE$$

Therefore the function is discontinuous. There is an infinite discontinuity.

$$\text{b) } \lim_{x \rightarrow 0^-} f(x) = 0 \quad \lim_{x \rightarrow 0^+} f(x) = -1 \quad f(0) = 0 \quad \lim_{x \rightarrow 0^-} f(x) \neq \lim_{x \rightarrow 0^+} f(x)$$

Therefore the function is discontinuous. There is a jump discontinuity.

$$\text{c) } \lim_{x \rightarrow 3^-} f(x) = -3 \quad \lim_{x \rightarrow 3^+} f(x) = -\infty \quad f(3) = DNE$$

Therefore the function is discontinuous. There is an infinite discontinuity.