

<p>1) a) <math>\lim_{x \rightarrow -1} f(x)</math> DNE</p> <p>b) <math>f(x)</math> has a jump discontinuity at <math>x = -1</math></p> <p>c) <math>f(x)</math> is continuous on <math>(-\infty, -1) \cup (-1, \infty)</math></p>	<p>2) a) <math>f(x)</math> is not continuous at <math>x = 2</math> b/c <math>f(2)</math> is undefined.</p> <p>b) <math>f(x)</math> has a removable discontinuity at <math>x = 2</math></p> <p>c) <math>f(x)</math> is continuous on <math>(-\infty, 2) \cup (2, \infty)</math></p>
<p>3) a) <math>f(x)</math> is not continuous at <math>x = 3</math> b/c <math>f(3)</math> is undefined</p> <p>b) <math>f(x)</math> has an infinite discontinuity at <math>x = 3</math></p> <p>c) <math>f(x)</math> is continuous on <math>(-\infty, 0) \cup (0, 3) \cup (3, \infty)</math></p>	<p>4) a) <math>f(x)</math> is not continuous at <math>x = 1</math> b/c <math>f(1) = 2 \neq \lim_{x \rightarrow 1} f(x) = -2</math></p> <p>b) <math>f(x)</math> has a removable discontinuity at <math>x = 1</math></p> <p>c) <math>f(x)</math> is continuous on <math>(-\infty, 1) \cup (1, \infty)</math>.</p>

$$5) f(x) = \begin{cases} \sin \pi x, & x \leq 2 \\ x^2 + 3x - 9, & x > 2 \end{cases}$$

I.  $f(2) = 0$

II.  $\lim_{x \rightarrow 2^-} f(x) = 0 \neq \lim_{x \rightarrow 2^+} f(x) = 1$

$f(x)$  is not continuous at  $x = 2$   
b/c  $\lim_{x \rightarrow 2} f(x)$  DNE

$$6) f(x) = \begin{cases} -2x + 3, & x < 1 \\ x^2, & x \geq 1 \end{cases}$$

I.  $f(1) = 1$

II.  $\lim_{x \rightarrow 1^-} f(x) = 1 = \lim_{x \rightarrow 1^+} f(x) = 1$

$$\lim_{x \rightarrow 1} f(x) = 1$$

III.  $f(1) = \lim_{x \rightarrow 1} f(x)$

$f(x)$  is continuous at  $x = 1$ .

7)

$$f(x) = \begin{cases} x^3, & x \leq 2 \\ ax^2, & x > 2 \end{cases}$$

$$\lim_{x \rightarrow 2^-} f(x) = 8 \quad \lim_{x \rightarrow 2^+} f(x) = 4a$$

$$4a = 8$$

$$\boxed{a = 2}$$

8)

$$f(x) = \begin{cases} 4-x^2, & x < -1 \\ ax^2-1, & x > -1 \end{cases}$$

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

$$a-1 = 3$$

$$\boxed{a = 4}$$

9)

$$f(x) = \begin{cases} 2, & x \leq -1 \\ ax+b, & -1 < x < 3 \\ -2, & x \geq 3 \end{cases}$$

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

$$-a+b = 2$$

$$b = 2+a$$

$$\boxed{b = 1}$$

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

$$3a+b = -2$$

$$3a + 2 + a = -2$$

$$4a = -4$$

$$\boxed{a = -1}$$

10)

$$f(x) = \begin{cases} x^2+3x, & x < 2 \\ a, & x = 2 \\ 7x-4, & x > 2 \end{cases}$$

$$\text{I. } f(2) = a$$

$$\text{II. } \lim_{x \rightarrow 2^-} (x^2+3x) = 10 \quad \lim_{x \rightarrow 2^+} (7x-4) = 10$$

$$\lim_{x \rightarrow 2} f(x) = 10$$

$$\text{III. } f(2) = 10 \quad \boxed{a = 10}$$