2.3 AP Style Questions

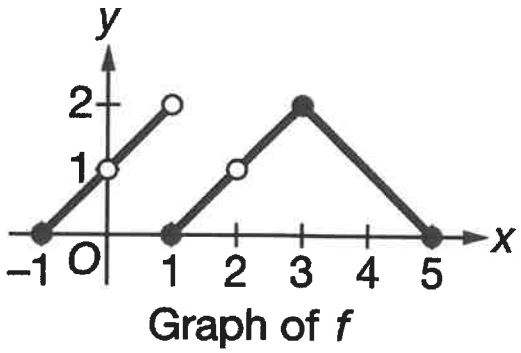
1. The graph of the function f is shown below. What are all the values of x for which f has a removable discontinuity?

   a. 0 only

   b. 1 only

   c. 0 and 2 only

   d. 0, 1, and 2 only



Graph of f

2. Let f be the function defined by $f(x) = \frac{3x^3+2x^2}{x^2-x}$. Which of the following statements is true?

   (A) f has a discontinuity due to a vertical asymptote at $x = 0$ and at $x = 1$.

   (B) f has a removable discontinuity at $x = 0$ and a jump discontinuity at $x = 1$.

   (C) f has a removable discontinuity at $x = 0$ and a discontinuity due to a vertical asymptote at $x = 1$.

   (D) f is continuous at $x = 0$, and f has a discontinuity due to a vertical asymptote at $x = 1$.

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

$x \neq 0$ removable

$x \neq 1$ VA

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

$\lim_{x\to 1^-} f(x) = 3$ $\lim_{x\to 1^+} f(x) = 3$

3. Let f be the piecewise function below. Which of the following statements is false?

a. f is continuous at $x = 1$

b. f is continuous at $x = 2$ polynomial

c. f is continuous at $x = 3$

d. f is continuous at $x = 4$ polynomial

$$f(x) = \begin{cases} x^2 + 2x & \text{for } x < 1 \\ 3 & \text{for } x = 1 \\ x^3 + x^2 + x & \text{for } 1 < x < 3 \\ 0 & \text{for } x = 3 \\ 2x + 1 & \text{for } x > 3 \end{cases}$$

$\lim_{x\to 3^-} f(x) = 3^3 + 3^2 + 3 = 39$ $\lim_{x\to 3^+} f(x) = 0$ jump discontinuity @ $x=3$

4. What is the domain of the function given by $f(x) = \frac{\sqrt{x^2-4}}{x-3}$?

a. $\{x : x \neq 3\}$

b. $\{x : |x| \leq 2\}$

c. $\{x : |x| \geq 2\}$

d. $\{x : |x| \geq 2 \text{ and } x \neq 3\}$

e. $\{x : x \geq 2 \text{ and } x \neq 3\}$

$x^2 - 4 \geq 0$ $x \neq 3$

$x^2 \geq 4$

$\sqrt{x^2} \geq \sqrt{4}$

$|x| \geq 2$

5. Let f be the function defined by $f(x) = \begin{cases} x^2 + 2 & \text{for } x \leq 3, \\ 6x + k & \text{for } x > 3. \end{cases}$

If f is continuous at $x = 3$, what is the value of k?

a. -7

b. 2

c. 3

d. 7

$\lim_{x\to 3^-} f(x) = 3^2 + 2 = 11$ $\lim_{x\to 3^+} f(x) = 6(3) + K = 18 + K$

$\lim_{x\to 3^-} f(x) = \lim_{x\to 3^+} f(x)$

$11 = 18 + K$

$-7 = K$

$2(x^2+7x-8)$

6. Let f be the function given by $f(x) = \frac{2x^2+14x-16}{x^2-9x+8}$. For what values of x does f have a removable discontinuity?

$\frac{2(x+8)(x-1)}{(x-8)(x-1)}$

(A) 1 only

(B) 8 only

$\frac{2(x+8)}{x-8}$ $x \neq 1$

(C) −8 and 1

(D) 1 and 8

$$f(x) = \begin{cases} a^2 + x^2 & \text{for } x < 3 \\ a(x+3) & \text{for } x \geq 3 \end{cases}$$

7. Let f be the function defined above, where a is a constant. For what values of a, if any, is f continuous at $x = 3$?

(A) 0 only

$\lim_{x \to 3^-} f(x) = 9 + a^2$ $\lim_{x \to 3^+} f(x) = 6a$

(B) 3 only

$\lim_{x \to 3^-} f(x) = \lim_{x \to 3^+} f(x)$

$9 + a^2 = 6a$

(C) 0 and 3

$a^2 - 6a + 9 = 0$

(D) There is no such a.

$(a-3)^2 = 0$

$a = 3$