Unit 1 Progress Check: MCQ Part c

1. Let f be the function given by $f(x) = \frac{|x^2-2|(x+0.4)}{(x^2-2)(x+0.4)}$. On which of the following open intervals is f continuous?

(A) $(-2, -1)$

(B) $(-1, 0)$

(C) $(0, 1)$ ✓

(D) $(1, 2)$

2. $f(x) = \begin{cases} e^{bx} & \text{for } x \leq 3 \\ \frac{2}{3}x + b & \text{for } x > 3 \end{cases}$

Let f be the function defined above. For what values of b is f continuous at $x = 3$?

(A) 0.394 only

(B) 0.274 only

(C) -4.500 and 0.394

(D) -1.998 and 0.274 ✓

3. Let f be the function given by $f(x) = 2x + \tan\left(\frac{x}{5}\right) - 15$. The Intermediate Value Theorem applied to f on the closed interval $[10, 15]$ guarantees a solution in $[10, 15]$ to which of the following equations?

(A) $f(x) = -15$

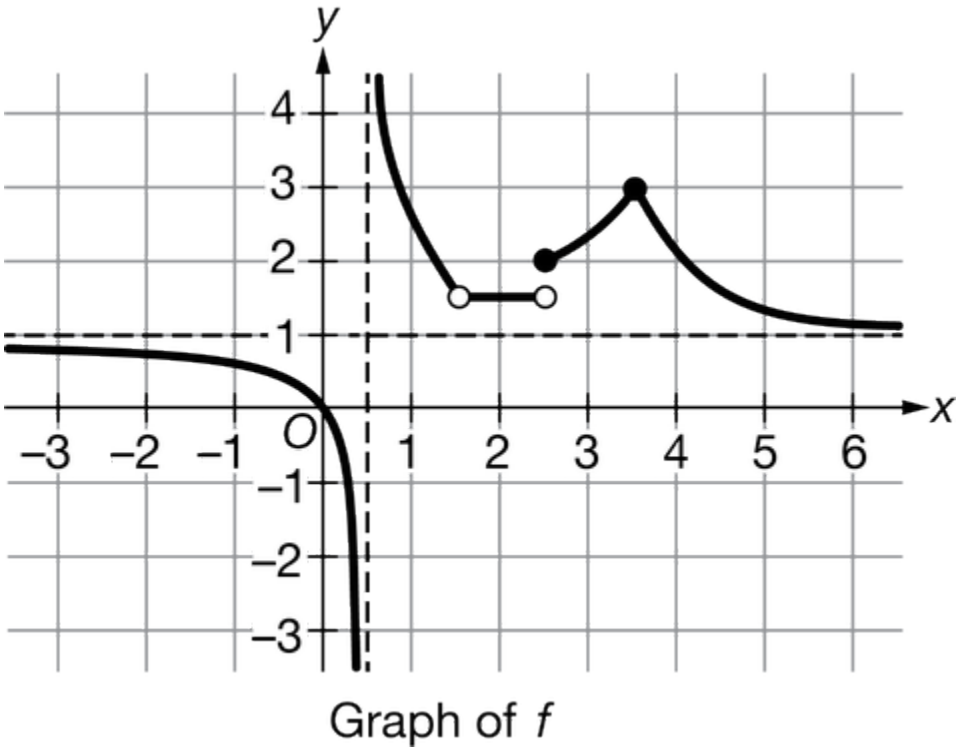
(B) $f(x) = 0$

(C) $f(x) = 5$ ✓

(D) $f(x) = 15$

Unit 1 Progress Check: MCQ Part c

4.



Graph of f

The graph of the function f is shown above. On which of the following intervals is f continuous?

(A) $(0, 1)$

(B) $(1, 2)$

(C) $(2, 3)$

(D) $(3, 4)$ ✓

5. The function f is continuous on the interval $-2 < x < 5$ and is not continuous on the interval $-2 \leq x \leq 5$. Which of the following could not be an expression for $f(x)$?

(A) $\frac{x+2}{x-5}$

(B) $\frac{x-5}{x+2}$

(C) $(x+2)(x-5)$ ✓

(D) $\frac{1}{(x+2)(x-5)}$

6. $g(x) = \begin{cases} \frac{x^2-4}{4x+8} & \text{for } x \neq -2 \\ k & \text{for } x = -2 \end{cases}$

Let g be the function defined above, where k is a constant. For what value of k is g continuous at $x = -2$?

Unit 1 Progress Check: MCQ Part c

(A) -2

(B) -1 ✓

(C) $-\frac{1}{2}$

(D) 0

7. $f(x) = \begin{cases} 2c + c\sin\left(\frac{\pi}{2}x\right) & \text{for } x < 3 \\ 7 & \text{for } x = 3 \\ 2c + 5x & \text{for } x > 3 \end{cases}$

Let f be the function defined above. For what value of c, if any, is f continuous at $x = 3$?

(A) -4

(B) 7

(C) -15

(D) There is no such c. ✓

8. The function h is defined by $h(x) = \frac{x^2-9}{x-4}$. Which of the following statements must be true?

(A) $\lim_{x\to 4^-} h(x) = -\infty$ and $\lim_{x\to 4^+} h(x) = -\infty$

(B) $\lim_{x\to 4^-} h(x) = +\infty$ and $\lim_{x\to 4^+} h(x) = -\infty$

(C) $\lim_{x\to 4^-} h(x) = -\infty$ and $\lim_{x\to 4^+} h(x) = +\infty$ ✓

(D) $\lim_{x\to 4^-} h(x) = +\infty$ and $\lim_{x\to 4^+} h(x) = +\infty$

9. Let f be a function such that $\lim_{x\to 3^-} f(x) = \infty$. Which of the following statements must be true?

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

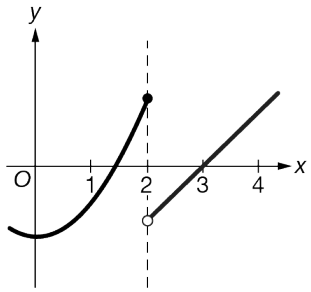
(B) f is undefined at $x = 3$.

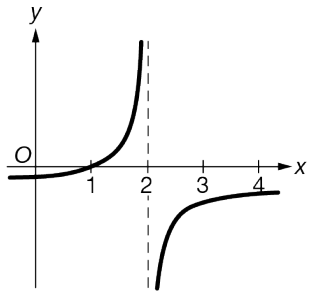
(C) The graph of f has a vertical asymptote at $x = 3$. ✓

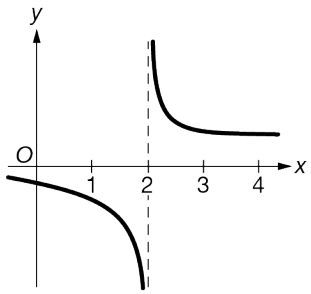
(D) The graph of f has a vertical asymptote at $x = -3$.

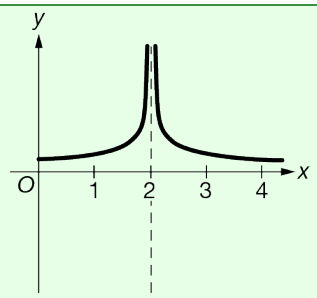
10. Let f be a function of x. If $\lim_{x\to 2^-} f(x) = +\infty$ and $\lim_{x\to 2^+} f(x) = +\infty$, which of the following could be a graph of f ?

Unit 1 Progress Check: MCQ Part c

(A)


(B)


(C)


(D)


11. Let f be the function defined by $f(x) = \frac{3x+5}{x+2}$. Which of the following statements are true?

I. The graph of f has a horizontal asymptote at $y = 3$ because $\lim_{x \to \infty} f(x) = 3$.
II. The graph of f has a horizontal asymptote at $y = 3$ because $\lim_{x \to -\infty} f(x) = 3$.
III. The graph of f has a vertical asymptote at $x = -2$ because $\lim_{x \to -2^+} f(x) = -\infty$.

(A) I only
(B) III only
(C) I and II only
(D) I, II, and III

Unit 1 Progress Check: MCQ Part c

12. The population on an island is modeled by $P(t) = \frac{5000}{20+30e^{-0.03t}}$ for $t \geq 0$, where $P(t)$ is the number of people on the island after t years. What is $\lim_{t \to \infty} P(t)$?

(A) 100

(B) $\frac{500}{3}$

(C) 250 ✓

(D) 5000

13. Let f be the function defined by $f(x) = \frac{5x^{20}}{8e^x+9x^{20}}$ for $x > 0$. Which of the following is a horizontal asymptote to the graph of f ?

(A) $y = 0$ ✓

(B) $y = \frac{5}{9}$

(C) $y = \frac{5}{8}$

(D) There is no horizontal asymptote to the graph of f.

14. Let f be a function such that $f(3) < 4 < f(5)$. Which of the following statements provides sufficient additional information to conclude that there is a value $x = c$ in the interval $[3, 5]$ such that $f(c) = 4$?

(A) f is defined for all x.

(B) f is increasing for all x.

(C) f is continuous for all x. ✓

(D) There is a value $x = c$ in the interval $[3, 5]$ such that $\lim_{x \to c} f(x) = 4$.

15. Let f be a function of x. Which of the following statements, if true, would guarantee that there is a number c in the interval $[-5, 4]$ such that $f(c) = 12$?

(A) f is increasing on the interval $[-5, 4]$, where $f(-5) = 0$ and $f(4) = 20$.

(B) f is increasing on the interval $[-5, 4]$, where $f(-5) = 15$ and $f(4) = 30$.

(C) f is continuous on the interval $[-5, 4]$, where $f(-5) = 0$ and $f(4) = 20$. ✓

(D) f is continuous on the interval $[-5, 4]$, where $f(-5) = 15$ and $f(4) = 30$.