## Unit 1 Progress Check: MCQ Part C

**1.** Let $f$ be the function given by $f(x) = \dfrac{|x^2-3|\cdot(x+0.5)}{(x^2-3)(x+0.5)}$. On which of the following open intervals is $f$ continuous?

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

(B) $(-1, 0)$

(C) $(0, 1)$ ✔

(D) $(1, 2)$

---

**2.** $f(x) = \begin{cases} e^{bx} & \text{for } x \le 2 \\ 1.5x + b & \text{for } x > 2 \end{cases}$

Let $f$ be the function defined above. For what values of $b$ is $f$ continuous at $x = 2$ ?

(A) $0.508$ only

(B) $0.647$ only

(C) $-1.282$ and $0.508$

(D) $-2.998$ and $0.647$ ✔

---

**3.** Let $f$ be the function given by $f(x) = x + \tan\left(\dfrac{x}{5}\right) - 10$. The Intermediate Value Theorem applied to $f$ on the closed interval $[12, 15]$ guarantees a solution in $[12, 15]$ to which of the following equations?
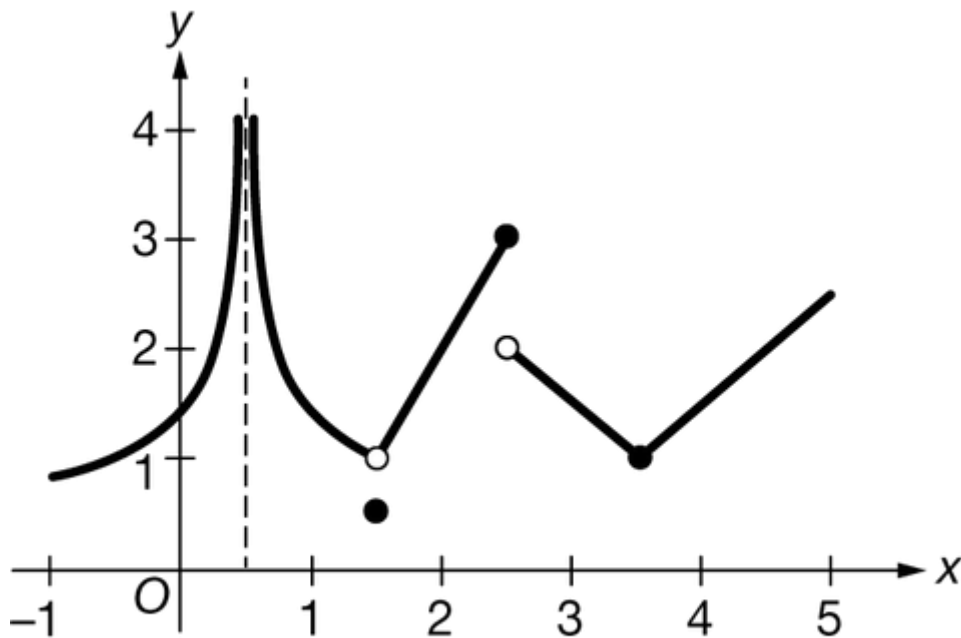
## Unit 1 Progress Check: MCQ Part C

Ⓐ $f(x) = -10$

Ⓑ $f(x) = 0$

Ⓒ $f(x) = 4$ ✔

Ⓓ $f(x) = 14$

---

**4.**



Graph of $f$

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

## Unit 1 Progress Check: MCQ Part C

(A) $(-1, 1)$

(B) $(1, 2)$

(C) $(2, 3)$

(D) $(3, 5)$ ✔

---

5. The function $f$ is continuous on the interval $-1 < x < 3$ and is not continuous on the interval $-1 \le x \le 3$. Which of the following could not be an expression for $f(x)$ ?

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

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

(C) $(x+1)(x-3)$ ✔

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

---

6. $g(x) = \begin{cases} \frac{x^2-9}{4x+12} & \text{for } x \ne -3 \\ k & \text{for } x = -3 \end{cases}$

   Let $g$ be the function defined above, where $k$ is a constant. For what value of $k$ is $g$ continuous at $x = -3$ ?

## Unit 1 Progress Check: MCQ Part C

(A) $-3$

(B) $-\frac{3}{2}$ ✔

(C) $-\frac{3}{4}$

(D) $0$

---

**7.**

$$f(x) = \begin{cases} c + cx - x^2 & \text{for } x < 3 \\ 7 & \text{for } x = 3 \\ 2c + \frac{3}{x-2} & \text{for } x > 3 \end{cases}$$

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

(A) 2

(B) 4

(C) 6

(D) There is no such $c$. ✔

---

**8.** The function $h$ is defined by $h(x) = \frac{x^2 - 7}{x - 3}$. Which of the following statements must be true?

## Unit 1 Progress Check: MCQ Part C

(A) $\lim\limits_{x\to3^-} h(x) = -\infty$ and $\lim\limits_{x\to3^+} h(x) = -\infty$

(B) $\lim\limits_{x\to3^-} h(x) = +\infty$ and $\lim\limits_{x\to3^+} h(x) = -\infty$

(C) $\lim\limits_{x\to3^-} h(x) = -\infty$ and $\lim\limits_{x\to3^+} h(x) = +\infty$ ✔️

(D) $\lim\limits_{x\to3^-} h(x) = +\infty$ and $\lim\limits_{x\to3^+} h(x) = +\infty$

---

9. Let $f$ be a function such that $\lim\limits_{x\to5^-} f(x) = \infty$. Which of the following statements must be true?

(A) $\lim\limits_{x\to5^+} f(x) = \infty$

(B) $f$ is undefined at $x = 5$.
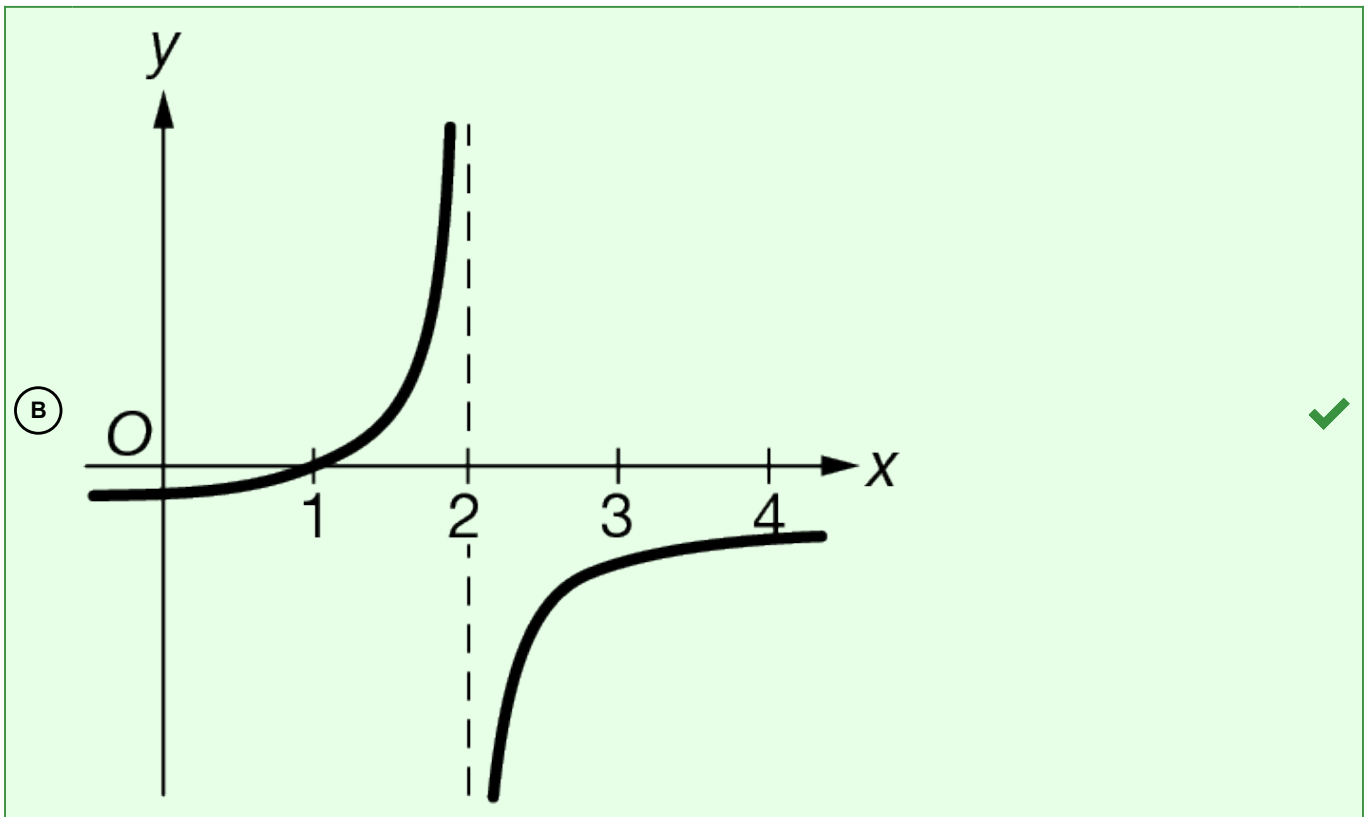
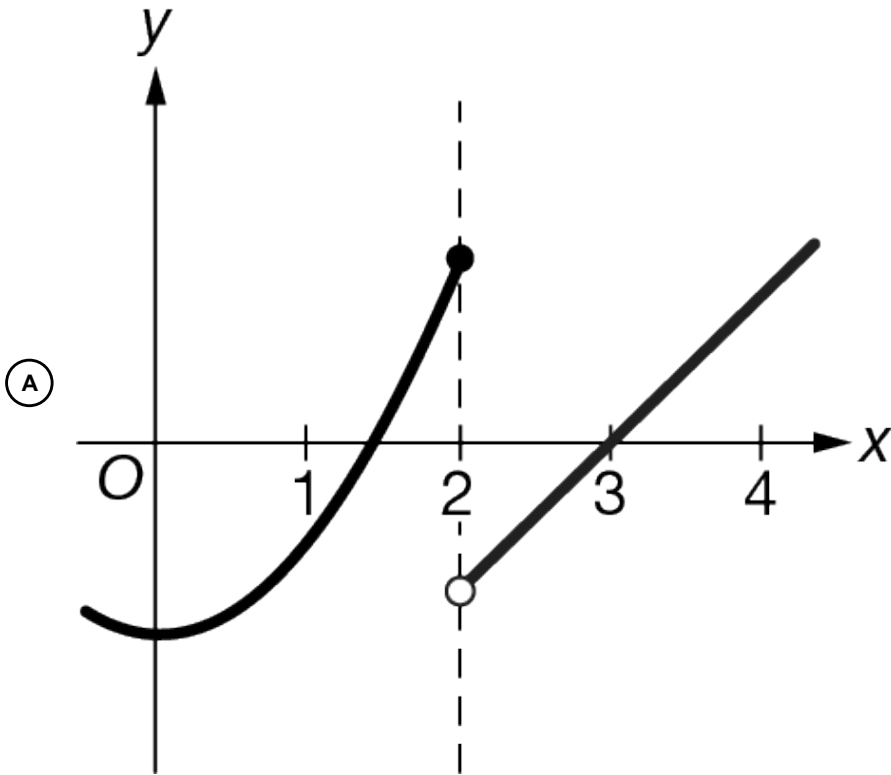(C) The graph of $f$ has a vertical asymptote at $x = 5$. ✔️

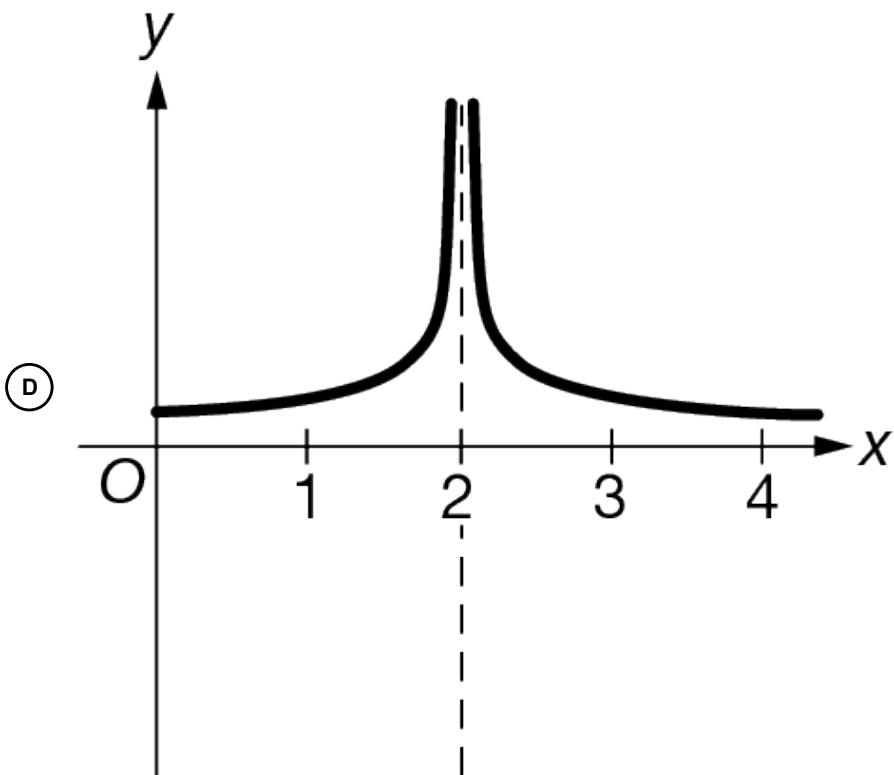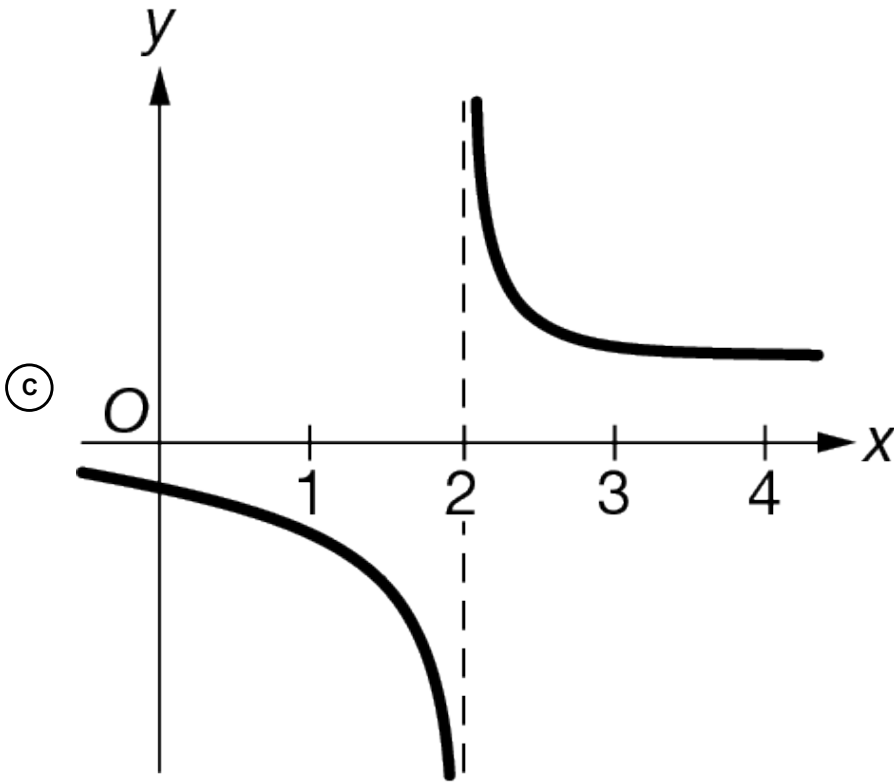(D) The graph of $f$ has a vertical asymptote at $x = -5$.

---

10. Let $f$ be a function of $x$. If $\lim\limits_{x\to2^-} f(x) = +\infty$ and $\lim\limits_{x\to2^+} f(x) = -\infty$, which of the following could be a graph of $f$ ?

## Unit 1 Progress Check: MCQ Part C



A



B        ✔

C



D

## Unit 1 Progress Check: MCQ Part C

**11.** Let $f$ be the function defined by $f(x) = \frac{2x+3}{x+1}$. Which of the following statements are true?

1. The graph of $f$ has a horizontal asymptote at $y = 2$ because $\lim\limits_{x \to \infty} f(x) = 2$.
2. The graph of $f$ has a horizontal asymptote at $y = 2$ because $\lim\limits_{x \to -\infty} f(x) = 2$.
3. The graph of $f$ has a vertical asymptote at $x = -1$ because $\lim\limits_{x \to -1^+} f(x) = \infty$.

(A) I only

(B) III only

(C) I and II only

(D) I, II, and III ✔

**12.** The population on an island is modeled by $P(t) = \frac{6000}{40 + 60e^{-0.03t}}$ for $t \geq 0$, where $P(t)$ is the number of people on the island after $t$ years. What is $\lim\limits_{t \to \infty} P(t)$ ?

(A) 60

(B) 100

(C) 150 ✔

(D) 6000

**13.** Let $f$ be the function defined by $f(x) = \frac{3x^{20}}{4e^x + 8x^{20}}$ for $x > 0$. Which of the following is a horizontal asymptote to the graph of $f$ ?

## Unit 1 Progress Check: MCQ Part C

---

**(A)** $y = 0$                                                                              ✔

**(B)** $y = \frac{3}{8}$

**(C)** $y = \frac{3}{4}$

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

---

14. Let $f$ be a function such that $f(5) < 6 < f(7)$. Which of the following statements provides sufficient additional information to conclude that there is a value $x = c$ in the interval $[5, 7]$ such that $f(c) = 6$ ?

**(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 $[5, 7]$ such that $\lim_{x \to c} f(x) = 6$.

---

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 $[-2, 3]$ such that $f(c) = 10$ ?

## Unit 1 Progress Check: MCQ Part C

(A) $f$ is increasing on the interval $[-2, 3]$, where $f(-2) = 0$ and $f(3) = 20$.

(B) $f$ is increasing on the interval $[-2, 3]$, where $f(-2) = 15$ and $f(3) = 30$.

(C) $f$ is continuous on the interval $[-2, 3]$, where $f(-2) = 0$ and $f(3) = 20$. ✔

(D) $f$ is continuous on the interval $[-2, 3]$, where $f(-2) = 15$ and $f(3) = 30$.