

The function f is defined by $f(x) = (x+3)(x+1)$.
 The graph of f in the xy -plane is a parabola. Which
 of the following intervals contains the x -coordinate h
 of the vertex of the graph of f ? (h, k)

- A) $-4 < x < -3$
- B) $-3 < x < 1$
- C) $1 < x < 3$
- D) $3 < x < 4$

1st method

$$\begin{aligned} & (x+3)(x+1) \\ &= x^2 + x + 3x + 3 \\ &= x^2 + 4x + 3 \\ h &= -\frac{b}{2a} = -\frac{4}{2(1)} = -2 \\ &\leftarrow \begin{array}{c} -3 \quad -2 \quad 1 \\ \bullet \end{array} \rightarrow \end{aligned}$$

2nd method

$$\begin{aligned} & \frac{(x+3)(x+1)}{x+3} \\ & \bullet -3 \text{ and } -1 \rightarrow x\text{-intercepts} \\ & \begin{array}{ccc} & \nearrow & \uparrow \\ & -3 & -1 \\ & \searrow & \downarrow \end{array} \rightarrow \begin{array}{l} \text{the vertex} \\ \text{is the} \\ \text{average of} \\ \text{the } x\text{-intercepts} \end{array} \\ & \frac{(-3)+(-1)}{2} = -\frac{4}{2} = -2 \end{aligned}$$

choice B.