

**Topic:** Solving with conjugate method**Question:** Use conjugate method to find the limit.

$$\lim_{m \rightarrow 0} \frac{\sqrt{m+4} - 2}{m}$$

**Answer choices:**

A      0

B      4

C       $\frac{1}{4}$ D       $\infty$ 

**Solution: C**

The conjugate of  $\sqrt{m+4} - 2$  is  $\sqrt{m+4} + 2$ . Multiply both the numerator and denominator by this conjugate.

$$\lim_{m \rightarrow 0} \frac{\sqrt{m+4} - 2}{m} \left( \frac{\sqrt{m+4} + 2}{\sqrt{m+4} + 2} \right)$$

$$\lim_{m \rightarrow 0} \frac{m + 4 + 2\sqrt{m+4} - 2\sqrt{m+4} - 4}{m(\sqrt{m+4} + 2)}$$

$$\lim_{m \rightarrow 0} \frac{m + 4 - 4}{m(\sqrt{m+4} + 2)}$$

$$\lim_{m \rightarrow 0} \frac{m}{m(\sqrt{m+4} + 2)}$$

Cancel the common factor of  $m$  from both the numerator and denominator.

$$\lim_{m \rightarrow 0} \frac{1}{\sqrt{m+4} + 2}$$

Now use substitution to evaluate the limit.

$$\frac{1}{\sqrt{0+4} + 2}$$

$$\frac{1}{2+2}$$



$$\frac{1}{4}$$



**Topic:** Solving with conjugate method**Question:** Use conjugate method to find the limit.

$$\lim_{x \rightarrow 9} \frac{x - 9}{\sqrt{x} - 3}$$

**Answer choices:**

- A      6
- B      3
- C      9
- D      0



**Solution: A**

The conjugate of  $\sqrt{x} - 3$  is  $\sqrt{x} + 3$ . Multiply both the numerator and denominator by this conjugate.

$$\lim_{x \rightarrow 9} \frac{x - 9}{\sqrt{x} - 3} \left( \frac{\sqrt{x} + 3}{\sqrt{x} + 3} \right)$$

$$\lim_{x \rightarrow 9} \frac{(x - 9)(\sqrt{x} + 3)}{(\sqrt{x} - 3)(\sqrt{x} + 3)}$$

$$\lim_{x \rightarrow 9} \frac{(x - 9)(\sqrt{x} + 3)}{x + 3\sqrt{x} - 3\sqrt{x} - 9}$$

$$\lim_{x \rightarrow 9} \frac{(x - 9)(\sqrt{x} + 3)}{x - 9}$$

Cancel the common factor of  $x - 9$  from both the numerator and denominator.

$$\lim_{x \rightarrow 9} \sqrt{x} + 3$$

Now use substitution to evaluate the limit.

$$\sqrt{9} + 3$$

$$3 + 3$$

$$6$$



**Topic:** Solving with conjugate method**Question:** Use conjugate method to find the limit.

$$\lim_{x \rightarrow 16} \frac{16 - x}{4 - \sqrt{x}}$$

**Answer choices:**

- A      4
- B      8
- C      0
- D      16



**Solution: B**

The conjugate of  $4 - \sqrt{x}$  is  $4 + \sqrt{x}$ . Multiply both the numerator and denominator by this conjugate.

$$\lim_{x \rightarrow 16} \frac{16 - x}{4 - \sqrt{x}} \left( \frac{4 + \sqrt{x}}{4 + \sqrt{x}} \right)$$

$$\lim_{x \rightarrow 16} \frac{(16 - x)(4 + \sqrt{x})}{(4 - \sqrt{x})(4 + \sqrt{x})}$$

$$\lim_{x \rightarrow 16} \frac{(16 - x)(4 + \sqrt{x})}{16 + 4\sqrt{x} - 4\sqrt{x} - x}$$

$$\lim_{x \rightarrow 16} \frac{(16 - x)(4 + \sqrt{x})}{16 - x}$$

Cancel the common factor of  $16 - x$  from both the numerator and denominator.

$$\lim_{x \rightarrow 16} 4 + \sqrt{x}$$

Now use substitution to evaluate the limit.

$$4 + \sqrt{16}$$

$$4 + 4$$

$$8$$

