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Find the value of *k* in each of the Exercises 11 to 14 so that the function *f* is continuous at the indicated point:

11.

$$f(x)=\begin{cases}3x-8, & if\ x\le 5\\ 2k\ \ , & if\ x>5\end{cases} \quad \text{at } x=5$$

Solution:

Finding the left hand and right hand limits for the given function, we have

$$\lim_{x\to 5^-} f(x) = 3x-8$$

$$= \lim_{h\to 0} 3(5-h)-8 = 15-8=7$$

$$\lim_{x\to 5^+} f(x) = 2k$$

As the function is continuous at $x = 5$

$$\lim_{x\to 5^-} f(x) = \lim_{x\to 5^+} f(x)$$

So,

7 = 2k

k = 7/2 = 3.5

Therefore, the value of k is 3.5

12.

$$f(x)=\begin{cases}\dfrac{2^{x+2}-16}{4^x-16}, & if\ x\neq 2\\ k\ \ \ \ \ \ \ , & if\ x=2\end{cases} \quad \text{at} \quad x=2$$

Solution:

The given function f(x) can be rewritten as,

$$f(x) = \frac{2^{x+2} - 16}{4^x - 16} = \frac{2^2.2^x - 16}{(2^x)^2 - (4)^2} = \frac{4(2^x - 4)}{(2^x - 4)(2^x + 4)}$$

$$f(x) = \frac{4}{2^x + 4}$$

$$\lim_{x \to 2^-} f(x) = \lim_{h \to 0} \frac{4}{2^{2-h} + 4} = \frac{4}{2^2 + 4} = \frac{4}{4+4} = \frac{4}{8} = \frac{1}{2}$$

$$\lim_{x \to 2} f(x) = k$$

As the function is continuous at $x = 2$.

$$\therefore \lim_{x \to 2^-} f(x) = \lim_{x \to 2} f(x)$$

So, k = ½

Therefore, the value of k is ½

13.

$$f(x) = \begin{cases} \dfrac{\sqrt{1+kx} - \sqrt{1-kx}}{x}, & if \ -1 \le x < 0 \\ \dfrac{2x+1}{x-1}, & if \ 0 \le x \le 1 \end{cases} \quad \text{at } x = 0$$

Solution:

Finding the left hand and right hand limits for the given function, we have