Answer on Question #55720 – Math– Calculus

1) The differential coefficient of $y = \sin(3x + 2)$ is

Solution

Method 1

Using the table of derivatives calculate the differential coefficient of $y = \sin(3x + 2)$:

$y' = \frac{df(x)}{dx} = (\sin(t))'|_{t=3x+2} \cdot (3x + 2)' = \cos(3x + 2) \cdot 3 = 3\cos(3x + 2).$

Here we applied the chain rule of differentiation and the following properties of derivatives:

$(f(x) + g(x))' = f'(x) + g'(x),$

$(af(x))' = a \cdot f'(x),$

and well-known table formulae:

$x' = 1,$

$b' = 0$, where b is a real constant,

$sin'(x) = \cos(x).$

Method 2

In different way, using the definition of derivative, we have

$$y'(x_0) = \lim_{\Delta x \to 0} \frac{f(x_0 + \Delta x) - f(x_0)}{\Delta x} = \lim_{\Delta x \to 0} \frac{\sin(3(x_0 + \Delta x) + 2) - \sin(3x_0 + 2)}{\Delta x} =$$

$$= \lim_{\Delta x \to 0} \frac{\sin(3x_0 + 2)\cos(3\Delta x) + \sin(3\Delta x)\cos(3x_0 + 2) - \sin(3x_0 + 2)}{\Delta x} =$$

$$= \lim_{\Delta x \to 0} \frac{3\Delta x \frac{\sin(3\Delta x)}{3\Delta x} \cos(3x_0 + 2)}{\Delta x} = 3\cos(3x_0 + 2).$$

Answer: the differential coefficient of $y = \sin(3x + 2)$ is $3\cos(3x + 2)$.

2) $\lim_{x \to -3} (x^3 + 5) =$

Solution.

$$\lim_{x \to -3} (x^3 + 5) = (-3)^3 + 5 = -27 + 5 = -22.$$

Answer. $\lim_{x \to -3} (x^3 + 5) = -22.$