

Answer on Question #47125 - Math - Calculus

Question:

Find the maximum and minimum values of function $f(x)$ equal to $\sin x + \cos 2x$ in $(0, 2\pi)$

Solution:

Points, where derivative is 0, are found from the following equation:

$$f'(x) = \cos x - \sin 2x = 0$$

$$\cos x - 2 \sin x \cos x = 0$$

$$\cos x (1 - 2 \sin x) = 0$$

$$\cos x = 0 \text{ or } 1 - 2 \sin x = 0$$

1) The first case:

$$\cos x = 0$$

$$x_1 = \frac{\pi}{2}, \frac{3\pi}{2}$$

$$f\left(\frac{\pi}{2}\right) = 0$$

$$f\left(\frac{3\pi}{2}\right) = -2$$

2) The second case:

$$1 - 2 \sin x = 0$$

$$\sin x = \frac{1}{2}$$

$$x_2 = \frac{\pi}{6}, \frac{5\pi}{6}$$

$$f\left(\frac{\pi}{6}\right) = \frac{1}{2} + \frac{\sqrt{3}}{2}$$

$$f\left(\frac{5\pi}{6}\right) = \frac{1}{2} + \frac{\sqrt{3}}{2}$$

Therefore maximum value in $(0, 2\pi)$ is $\frac{1}{2} + \frac{\sqrt{3}}{2}$, minimum value in $(0, 2\pi)$ is -2 .