Answer on Question #58170 – Math – Calculus

Question

If f(x)=x3+2cos(x)3sin(x), find f′(π2).

Solution

$$f'(x) = (x^3 + 2\cos(x) \cdot 3\sin(x))' = (x^3)' + (2\cos(x) \cdot 3\sin(x))' = 3x^2 + 6(\cos(x) \cdot \sin(x))' =$$
$$= 3x^2 + 6(\cos(x))' \sin(x) + 6(\sin(x))' \cos(x) = 3x^2 - 6\sin(x)\sin(x) + 6\cos(x)\cos(x) =$$
$$= 3x^2 + 6(cos^2(x) - sin^2(x));$$

$$f'(2\pi) = 3 \cdot (2\pi)^2 + 6\left(cos^2(2\pi) - sin^2(2\pi)\right) = 3 \cdot 4\pi^2 + 6 = 12\pi^2 + 6 \approx 124.435;$$

$$f'(\pi^2) = 3 \cdot (\pi^2)^2 + 6\left(cos^2(\pi^2) - sin^2(\pi^2)\right) = 3 \cdot \pi^4 + 6cos(2\pi^2) = 3\left(\pi^4 + 2cos(2\pi^2)\right) \approx$$
$$\approx 296.005.$$

Answer: $f'(2\pi) = 12\pi^2 + 6$, $f'(\pi^2) = 3\left(\pi^4 + 2cos(2\pi^2)\right)$.