

## Answer on Question #52187 – Math – Calculus

Find the differential coefficient of  $y = \cos 2x$

### Solution

In mathematics, **the differential coefficient of a function**  $y(x)$  is what is now called its derivative  $\frac{dy(x)}{dx}$ ,

the multiplicative factor or coefficient (not necessarily constant) of the differential  $dx$  in the differential  $dy(x)$ .

When the differential coefficient of a function has been found, the result, being a function of  $x$ , may be also differentiated, which gives the differential coefficient of the differential coefficient, or, as it is called, the second differential coefficient. Similarly the differential coefficient of the second differential coefficient is called the third differential coefficient, and so on.

The function	$y = \cos 2x$
The differential coefficient	$\frac{dy}{dx} = \frac{d(\cos 2x)}{d(2x)} \frac{d(2x)}{dx} = -\sin 2x \cdot 2 = -2 \sin 2x$
The second differential coefficient	$\frac{d^2 y}{dx^2} = \frac{d}{dx} \frac{dy}{dx} = \frac{d(-2 \sin 2x)}{d(2x)} \frac{d(2x)}{dx} = -2 \cos 2x \cdot 2 = -4 \cos 2x$
The third differential coefficient	$\frac{d^3 y}{dx^3} = \frac{d}{dx} \frac{d^2 y}{dx^2} = \frac{d(-4 \cos 2x)}{d(2x)} \frac{d(2x)}{dx} = -(-4 \sin 2x) \cdot 2 = 8 \sin 2x$

**Answer:**  $\frac{dy}{dx} = -2 \sin 2x$ .