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FINEVIEW

12. $y = \sin x$

where x is measured in radians.

Use differentiation from first principles to show that

$$\frac{dy}{dx} = \cos x$$

You may

- use without proof the formula for $\sin(A \pm B)$
- assume that as $h \to 0$, $\frac{\sin h}{h} \to 1$ and $\frac{\cos h - 1}{h} \to 0$

(5)

$$\frac{dy}{dx} = \lim_{h \to 0} \frac{\sin(x+h) - \sin(x)}{h} \qquad (\sin(A+B) = \sin A\cos B + \sin B\cos A)$$

$$= \lim_{h \to 0} \frac{\sin(x)\cos(h) + \sin(h)\cos(x) - \sin(x)}{h}$$

$$= \lim_{h \to 0} \left(\frac{\sin(x)(\cos(h) - 1)}{h} + \frac{\cos(x)\sin(h)}{h} \right)$$

$$= \sin(x)(0) + \cos(x)(1)$$

$$= \cos(x)$$