W2 – MORE Derivatives of Sine and Cosine Unit 3

MCV4U

Jensen

1) Determine the derivative of each function.

a) $y = \sin(4x)$

b) $f(x) = \sin(2x + \pi)$

c) $y = -2\sin(3\theta)$

d) $y = \sin^2 x$

e) $f(x) = \cos^2 x - \sin^2 x$

f) $y = 3\sin^2(2t - 4) - 2\cos^2(3t + 1)$

g) $f(t) = \sin^2(\cos t)$

h) $f(x) = -x^2 \sin(3x - \pi)$

i) $f(\theta) = \sin^2 \theta \cos^2 \theta$

j) $y = x^{-1} \cos^2 x$

k) $y = 2 \tan x - \tan(2x)$

l) $y = (\tan x + \cos x)^2$

2) Find the slope of the function $y = 2\cos x \sin(2x)$ at $x = \frac{\pi}{2}$.

3) Find the equation of the line that is tangent to $y = x^2 \sin(2x)$ at $x = -\pi$.

4) Determine $\frac{d^2y}{dx^2}$ for $y = x^2 \cos x$.

5)a) Write $y = \csc x$ in terms of $\sin x$ as a reciprocal function.

b) Write the function in terms of a negative power of $\sin x$

c) Use the power rule and chain rule to find the derivative of $y = \csc x$

Answers:

1)a) $\frac{dy}{dx} = 4\cos(4x)$ **b)** $f'(x) = 2\cos(2x + \pi)$ **c)** $\frac{dy}{d\theta} = -6\cos(3\theta)$ **d)** $\frac{dy}{dx} = 2\sin x \cos x$

e) $f'(x) = -2\sin(2x)$ **f)** $\frac{dy}{dx} = 12\sin(2t - 4)\cos(2t - 4) + 12\cos(3t + 1)\sin(3t + 1)$

g) $f'(t) = -2\sin(\cos t)\cos(\cos t)\sin t$ **h)** $f'(x) = -3x^2\cos(3x - \pi) - 2x\sin(3x - \pi)$

i) $f'(\theta) = -2\sin^3\theta\cos\theta + 2\sin\theta\cos^3\theta$ **j)** $\frac{dy}{dx} = \frac{-2}{x}\cos x \sin x - \frac{\cos^2 x}{x^2}$

k) $y' = 2\sec^2 x - 2\sec^2(2x)$ **l)** $y' = 2(\tan x + \cos x)(\sec^2 x - \sin x)$

2) 0

3) $y = 2\pi^2 x + 2\pi^3$

4) $\frac{d^2y}{dx^2} = -x^2\cos x - 4x\sin x + 2\cos x$

5)a) $y = \frac{1}{\sin x}$ **b)** $y = (\sin x)^{-1}$ **c)** $\frac{dy}{dx} = -\csc x \cot x$