

**W1 – Derivatives of Sine and Cosine**

Unit 3

MCV4U

Jensen

1) Find the derivative with respect to  $x$  for each function.

a)  $y = 4 \sin x$

b)  $f(x) = -3 \cos x$

c)  $y = \cos x - \sin x$

d)  $y = x^2 - 3 \sin x$

e)  $y = \cos x + 7\pi \sin x - 3x$

f)  $f(x) = \frac{\pi}{4} \cos x - \frac{\pi}{3} \sin x$

2) Find the equation of the line that is tangent to the function  $y = \cos x$  and passes through the point  $\left(\frac{\pi}{3}, \frac{1}{2}\right)$ .

3) Find the equation of the line that is tangent to the function  $y = -4 \sin x$  at  $x = \frac{\pi}{4}$ .

4) Determine an equation for the tangent to the function  $f(x) = \tan x$  at  $x = \frac{\pi}{4}$ .

5) Find an equation of a line that is tangent to  $y = 2 \sin x$  and whose slope is a max value.

**Answers:**

1) a)  $\frac{dy}{dx} = 4 \cos x$    b)  $f'(x) = 3 \sin x$    c)  $\frac{dy}{dx} = -\sin x - \cos x$    d)  $\frac{dy}{dx} = 2x - 3 \cos x$    e)  $\frac{dy}{dx} = -\sin x + 7\pi \cos x - 3$

f)  $\frac{dy}{dx} = -\frac{\pi}{4} \sin x - \frac{\pi}{3} \cos x$

2)  $y = -\frac{\sqrt{3}}{2}x + \frac{\pi\sqrt{3}+3}{6}$

3)  $y = -2\sqrt{2}x + \frac{\sqrt{2}\pi}{2} - 2\sqrt{2}$

4)  $y = 2x + 1 - \frac{\pi}{2}$

5)  $y = 2x$ ; note: there are an infinite number of solutions. The slope is at a max value at any  $x = 2k\pi$  where  $k \in \mathbb{Z}$ . Depending on which  $x$  value you choose, you will get a different  $y$ -int.