Derivatives of Sine and Cosine

p. 213 - 218 (3.4)

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$$\frac{d}{dx}[\sin(x)] = \cos(x) \qquad \frac{d}{dx}[\cos(x)] = -\sin(x)$$

Identities you need to memorize for this course include:

1. $\sin^2(x) + \cos^2(x) = 1$
2. $\sin(2x) = 2\sin(x)\cos(x)$
3. $\cos(2x) = \cos^2(x) - \sin^2 x = 1 - 2\sin^2 x = 2\cos^2 x - 1$

**1. If $f(x) = \sin x$,

then $(f)'\left(\frac{\pi}{3}\right) =$

$f'(x) = \cos x$

$f'\left(\frac{\pi}{3}\right) = \cos \pi/3 = \frac{1}{2}$

2. Find the derivative for

$$G(x) = \frac{1}{x^2} + 5\cos(x).$$

$G'(x) = -2x^{-3} - 5\sin x$

$= \frac{-2}{x^3} - 5\sin x$

3. For $f(x) = -4\cos(x) - \pi$

find $\frac{d^2y}{(d(x))^2}$.

$f'(x) = 4\sin x$

$f''(x) = 4\cos x$

**4. Find an equation of the line tangent to the graph of

$y = x + \cos x$ at the point (0,1)

$y' = 1 - \sin x$

$m = 1 - 0 = 1$

$y - 1 = 1(x - 0)$

$y = x + 1$

5. If $y = 6x\sin(x)$, find y'.

6 | cos x

$y' = 6x\cos x + 6\sin x$

6. Find $\frac{dy}{dx}$ if $y = \frac{3\sin x}{4 + \cos x}$

$$y' = \frac{(4+\cos x)(3\cos x) - (3\sin x)(-\sin x)}{(4+\cos x)^2}$$

$$= \frac{12\cos x + 3\cos^2 x + 3\sin^2 x}{(4+\cos x)^2} = \frac{12\cos x + 3}{4 + \cos x}$$