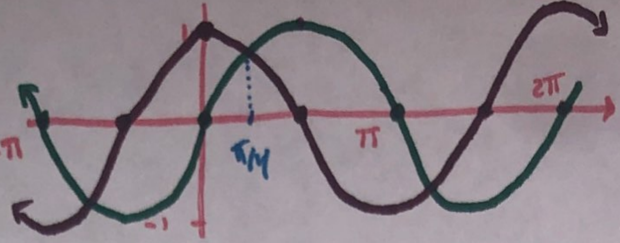
§ 3.3 - Derivatives of Trig Functions.

- $\sin(x)$
  $\cos(x)$



x	$\sin(x)$	$\cos(x)$	$\tan(x) = \frac{\sin(x)}{\cos(x)}$
0	0	1	0
$\pi/6$	$1/2$	$\sqrt{3}/2$	$1/\sqrt{3} = \sqrt{3}/3$
$\pi/4$	$\sqrt{2}/2$	$\sqrt{2}/2$	1
$\pi/3$	$\sqrt{3}/2$	$1/2$	$\sqrt{3}$
$\pi/2$	1	0	DNE

- → $[\sin(x)]' = \cos(x)$

→ $[\cos(x)]' = -\sin(x)$

$[-\sin(x)]' = -\cos(x)$

$[-\cos(x)]' = \sin(x)$

→ $[\tan(x)]' = \left[\frac{\sin(x)}{\cos(x)}\right]' = \frac{[\sin(x)]'\cos(x) - [\cos(x)]'\sin(x)}{\cos^2(x)} = \frac{\cos^2(x) + \sin^2(x)}{\cos^2(x)}$

$= \frac{1}{\cos^2(x)} = \boxed{\sec^2(x)}$

- → $[\sec(x)]' = \dots = \sec(x) \cdot \tan(x)$

$[\csc(x)]'$ + $[\cot(x)]'$ exist

$$[e^x \cdot \sin(x)]' = [e^x]'\sin(x) + e^x \cdot [\sin(x)]'$$
$$= e^x \sin(x) + e^x \cdot \cos(x)$$
$$= e^x[\sin(x) + \cos(x)]$$

$$\left[\frac{\sec(x)}{1+\tan(x)}\right]' = \frac{[\sec(x)]'(1+\tan(x)) - [1+\tan(x)]' \cdot \sec(x)}{[1+\tan(x)]^2}$$

$$= \frac{\sec(x)\cdot\tan(x)(1+\tan(x)) - [\sec^2(x)]\sec(x)}{(1+\tan(x))^2}$$

$$= \frac{\sec(x)\tan(x) + \sec(x)\tan^2(x) - \sec^3(x)}{(1+\tan(x))^2}$$

$$= \frac{\sec(x)(\tan(x) + \tan^2(x) - \sec^2(x))}{(1+\tan(x))^2}$$ $\tan^2(x)+1=\sec^2(x)$

$$= \frac{\sec(x)(\tan(x)-1)}{(1+\tan(x))^2}$$

Find $f'(0)$ when $f(x) = \cos(x)(e^x+3)$

$$[\cos(x)(e^x+3)]' = [\cos(x)]'(e^x+3) + \cos(x)[e^x+3]'$$
$$= -\sin(x)(e^x+3) + \cos(x)(e^x+0)$$
$$\therefore f'(0) = -\cancel{\sin(0)}^{0}(e^0+3) + \cos(0)(e^0)$$
$$0 + 1(1) = 1$$