Notes 1.4 **Derivatives of Trig Functions**

Derivatives of Trigonometric Functions

$\frac{d}{dx}\sin x = \cos x$ $\quad$ $\frac{d}{dx}\tan x = \sec^2 x$ $\quad$ $\frac{d}{dx}\cot x = -\csc^2 x$

$\frac{d}{dx}\cos x = -\sin x$ $\quad$ $\frac{d}{dx}\sec x = \sec x \tan x$ $\quad$ $\frac{d}{dx}\csc x = -\csc x \cot x$

Differentiate each of the following functions.

1. $\tan x^3$ $\quad \sec^2(x^3) * 3x^2$

$3x^2 \cdot \sec^2(x^3)$

2. $\sin 3x$ $\quad \cos 3x * 3$

$3\cos(3x)$

3. $\cos 3x^2$

$-\sin(3x^2) * 6x$

$-6x \cdot \sin(3x^2)$

4. $\sec 2x$ $\quad (\sec 2x)(\tan 2x) * 2$

$2(\sec 2x)(\tan 2x)$

5. $\cot x^2$

$-\csc^2(x^2) * 2x$

$-2x \cdot \csc^2(x^2)$

6. $\csc 5x$ $\quad (-\csc 5x)(\cot 5x) * 5$

$-5(\csc 5x)(\cot 5x)$

7. $\sin^5 x$

$(\sin x)^5 \rightarrow 5(\sin x)^4 \cdot \cos x$

$5\cos x \cdot \sin^4 x$

8. $x^2 \cos x$ $\quad f = x^2 \quad f' = 2x$

$g = \cos x \quad g' = -\sin x$

$(x^2)(-\sin x) + (\cos x)(2x)$

$-x^2(\sin x) + 2x(\cos x)$

9. $\frac{\sin\theta}{\cos\theta}$

$f = \sin\theta$

$g = \cos\theta$

$f' = \cos\theta$

$g' = -\sin\theta$

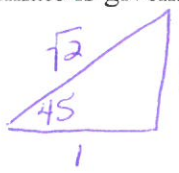
$\frac{(\cos\theta)(\cos\theta) - (\sin\theta)(-\sin\theta)}{(\cos\theta)^2}$

$\frac{\cos^2\theta + \sin^2\theta}{\cos^2\theta} = \frac{1}{\cos^2\theta} = \sec^2\theta$

Find an equation of the line tangent to the graph at the point whose x-coordinate is given.

10. $y = \tan x$ $\quad x = \frac{\pi}{4}$

$\frac{\pi}{4} = 45°$



$\sec \frac{\pi}{4} = \sqrt{2}$

$y' = \sec^2 x$ $\quad m = \sec^2\left(\frac{\pi}{4}\right)$

$m = (\sqrt{2})^2 = \boxed{2}$

$y = mx + b$ $\quad y = \tan\left(\frac{\pi}{4}\right)$

$\boxed{y = 1}$

$1 = 2\left(\frac{\pi}{4}\right) + b$

$1 = \frac{\pi}{2} + b$

$1 - \frac{\pi}{2} = b$

$\frac{2}{2} - \frac{\pi}{2} = \frac{2-\pi}{2} = b$

$\boxed{y = 2x + \left(\frac{2-\pi}{2}\right) \text{ OR } y = 2x - 0.57}$