

Key Concepts

Derivative of Trig Functions

- $\frac{d}{dx} \sin(x) = \cos(x)$
- $\frac{d}{dx} \cos(x) = -\sin(x)$
- $\frac{d}{dx} \tan(x) = \sec^2(x)$
- $\frac{d}{dx} \csc(x) = -\csc(x) \cot(x)$
- $\frac{d}{dx} \sec(x) = \sec(x) \tan(x)$
- $\frac{d}{dx} \cot(x) = -\csc^2(x)$
- You are required to memorize them for examination or quizzes
- Remember that trig functions that start with the letter c have a negative on their derivative

Review of Trig Identities

- $\tan(x) = \frac{\sin(x)}{\cos(x)}$
- $\cot(x) = \frac{\cos(x)}{\sin(x)}$
- $\csc(x) = \frac{1}{\sin(x)}$
- $\sec(x) = \frac{1}{\cos(x)}$
- $\cot(x) = \frac{1}{\tan(x)}$

Pythagorean Identity

- $\sin^2(x) + \cos^2(x) = 1$
- $\tan^2(x) + 1 = \sec^2(x)$

Practice Problem

Differentiate the following functions

1. $f(x) = 3x - \csc(x) + 4 \sin(x)$

2.

$$f(x) = \frac{\sin(x)}{1 + \cos(x)}$$

3. $f(x) = x^2 \sin(x)$ 4. $f(\theta) = \sin(2\theta)$ **HINT:** $\sin(2\theta) = 2 \sin(\theta) \cos(\theta)$ 5. Prove that $\frac{d}{dx} \cot(x) = -\csc^2(x)$