

## TRIGONOMETRIC FUNCTIONS $\frac{D}{DX} \tan X$ :

$$\frac{d}{dx} \tan x = \sec^2 x$$

$$\frac{d}{dx} \tan f(x) = f'(x) \sec^2 f(x)$$

Recall that product, quotient and chain rule also apply to trigonometric functions.

**Product Rule:**  $\frac{d}{dx} [f(x)g(x)] = f'(x)g(x) + f(x)g'(x)$

**Quotient Rule:**  $\frac{d}{dx} \left[ \frac{f(x)}{g(x)} \right] = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$

**Chain Rule:**  $\frac{d}{dx} [f(g(x))] = f'(g(x))g'(x)$

Common question types:

1.  $\frac{d}{dx} A \tan x = A \sec^2 x$

2.  $\frac{d}{dx} A \tan Bx = AB \sec^2 Bx$

3.  $\frac{d}{dx} A \tan^c x = \frac{d}{dx} A(\tan x)^c = AC \tan^{c-1} x \sec^2 x$

4.  $\frac{d}{dx} \cot x = \frac{d}{dx} (\tan x)^{-1} = -(\tan x)^{-2} \sec^2 x = -\csc^2 x$

### 4.5 WORKED EXAMPLE

Differentiate  $\tan(\sec x)$  with respect to  $x$ :