Derivatives of the Other Trigonometric Ratios

Outcomes: Find derivatives of tangent, cosecant, secant and cotangent

Investigate:
1. Write tan x in terms of sine and cosine. Use the quotient rule to find the of tan x.

2. Write sec x in terms of cosine Find the derivative of sec x.

3. Write csc x terms of sine. Find the derivative of csc x.

4. Write cotan x in sine and cosine. Use the quotient rule to find the derivative of cotan x.

$$\frac{d}{dx}\tan u = \sec^2 u \times \frac{du}{dx}$$
$$\frac{d}{dx}\sec u = \sec u \times \tan u \times \frac{du}{dx}$$

$$\frac{d}{dx}\csc u = -\csc u \times \cot u \times \frac{du}{dx}$$
$$\frac{d}{dx}\cot u = -\csc^2 u \times \frac{du}{dx}$$

Examples:

1. Find the derivative of the following

a) $y = x^2 \tan x$

b) $y = \sin x + \tan x$

c) $y = \dfrac{\tan^2 x}{x}$

d) $y = \sqrt{\tan 2x}$

e) $y = \dfrac{1}{\tan x + 1}$

f) $y = \sec(x^2 + 1)$

g) $y = \cot\sqrt{x}$.

h) $y = 2\csc 3x$.

i) $y = 2\sec^2(2x^3)$.

2. Find the vertical asymptotes of $y = \sec x + \tan x$ on $\left(-\dfrac{\pi}{2}, \dfrac{\pi}{2}\right)$

Homework: Pg 319 #1(first column), 2(a,e), 3(b,c), 7, 9(a)