SM 121 LESSON 25 1/2/6/8/15/17/18 10/6/2008

SECTION 3.3 TRIGONOMETRIC FUNCTIONS

① $f(x) = 3x^2 - 2\cos x$

$f'(x) = \frac{d}{dx} 3x^2 - 2\frac{d}{dx}\cos x$

$\boxed{f'(x) = 6x + 2\sin x}$

② $f(x) = \sqrt{x}\sin x$ $\quad u = x^{\frac{1}{2}}$ $\quad u' = \frac{1}{2}x^{-\frac{1}{2}}$

$f'(x) = \frac{d}{dx} uv$ $\quad v = \sin x$ $\quad v' = \cos x$

$= \left(\frac{1}{2}x^{-\frac{1}{2}}\right)(\sin x) + \left(x^{\frac{1}{2}}\right)(\cos x)$

$\boxed{f'(x) = \frac{\sin x}{2\sqrt{x}} + \sqrt{x}\cos x}$

⑥ $g(t) = 4\sec t + \tan t$

$g'(t) = 4(\sec t \tan t) + \sec^2 t$

$\boxed{g'(t) = \sec t(4\tan t + \sec t)}$

⑧ $y = e^u(\cos u + cu)$ $\quad y = e^u$ $\quad y' = e^u$

$y' = \frac{d}{du}(yz)$ $\quad z = \cos u + cu$ $\quad z' = c - \sin u$

$y' = e^u(c - \sin u) + e^u(\cos u + cu)$

$\boxed{y' = e^u(\cos u - \sin u + cu + c)}$

Lesson 25 — 10/6/2008

(15) $f(x) = xe^x \csc x$

$f'(x) = uv$

$= u'v + uv'$

$= e^x(1+x)(\csc x) + xe^x(-\csc x \cot x)$

$= e^x \csc x + xe^x \csc x - xe^x \csc x \cot x$

$u = yz \qquad u' = y'z + yz'$

$y = x \qquad y' = 1$

$z = e^x \qquad z' = e^x$

$u' = 1(e^x) + x(e^x)$

$u' = e^x(1+x)$

$v = \csc x \qquad v' = -\csc x \cot x$

$$\boxed{f'(x) = e^x \csc x (1 + x - x\cot x)}$$

(17) Prove $\frac{d}{dx}(\csc x) = -\csc x \cot x$

$$\frac{d}{dx}(\csc x) = \frac{d}{dx}\left(\frac{1}{\sin x}\right) = \frac{0(\sin x) - (1)(\cos x)}{\sin^2 x} = \frac{-\cos x}{\sin^2 x} = \frac{-1}{\sin x} \cdot \frac{\cos x}{\sin x}$$

$$\boxed{\frac{d}{dx}(\csc x) = -\csc x \cot x}$$

(18) Prove $\frac{d}{dx}(\sec x) = \sec x \tan x$

$$\frac{d}{dx}(\sec x) = \frac{d}{dx}\left(\frac{1}{\cos x}\right) = \frac{(0)(\cos x) - (1)(-\sin x)}{\cos^2 x} = \frac{\sin x}{\cos^2 x}$$

$$= \frac{1}{\cos x} \cdot \frac{\sin x}{\cos x}$$

$$\boxed{\frac{d}{dx}(\sec x) = \sec x \tan x}$$