Section 3.5

Part#2

Derivatives of Trigonometric Functions Continued

Review

$$\frac{d}{dx}\sin x = \cos x \qquad \frac{d}{dx}\csc x = -\csc x\cot x$$

$$\frac{d}{dx}\cos x = -\sin x \qquad \frac{d}{dx}\sec x = \sec x\tan x$$

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

Find the derivative of $y = \dfrac{\sin x}{5+\cos x}$.

$$y' = \frac{(5+\cos(x))\frac{d}{dx}(\sin(x)) - \sin(x)\frac{d}{dx}(5+\cos(x))}{(5+\cos(x))^2}$$

$$= \frac{(5+\cos(x))(\cos(x)) - \sin(x)(0-\sin(x))}{(5+\cos(x))^2}$$

$$= \frac{5\cos(x) + (\cos^2(x) + \sin^2(x))}{(5+\cos(x))^2}$$

$$= \frac{5\cos(x) + 1}{(5+\cos(x))^2}$$

The jerk is the derivative of the acceleration function with respect to time. (It is the third derivative of postition with respect to time.)

$$j(t)=\frac{da}{dt}=\frac{d^2v}{dt^2}=\frac{d^3s}{dt^3}$$

The simple harmonic motion is given by the $s(t)=8+10\cos(t)$. Find the equation of the jerk.

Find the value of the velocity, acceleration and jerk when $t=\frac{3\pi}{4}$.

$v(t) = s'(t) = 0 + 10(-\sin(x)) = -10\sin x$

$v\left(\frac{3\pi}{4}\right) = -10\sin\left(\frac{3\pi}{4}\right)$
$= -7.07\ m$

$a(t) = v'(t) = s''(t) = -10\cos(x)$

$a\left(\frac{3\pi}{4}\right) = -10\cos\left(\frac{3\pi}{4}\right) = 7.07\ \frac{m}{s}$

$j(t) = a'(t) = v''(t) = s'''(t) = 10\sin(x)$ ~~$10\cos(x)$~~

$j\left(\frac{3\pi}{4}\right) = 10\sin\left(\frac{3\pi}{4}\right) = 7.07\ \frac{m}{s}$

Given the equation below find the equation of the tangent when x = 4.

$$f(x) = x^3 \cos x$$

$f(4) = -41.8 \Rightarrow (4, -41.8)$

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

$f'(x) = x^3(-\sin(x)) + \cos(x)(3x^2)$

$f'(x) = -x^3 \sin(x) + 3x^2 \cos(x)$

$f'(4) = 17.1$

$y - y_1 = m(x - x_1)$

$y - (-41.8) = 17.1(x-4)$

$y + 41.8 = 17.1x - 68.4$

$y = 17.1x - 110.2$

p.146-7

#11-23 odd

29, 33, 35