HW #10

Section 3.5

$\boxed{148:2}$ $D(7\cos x) = {}^-7\sin x$

$\boxed{148:4}$ $D(-6\cot x) = +6\csc^2 x$

$\boxed{148:6}$ $D(5\csc x) = -5\csc x\cot x$

$\boxed{148:8}$ $D(x^3\cos x) = x^3\cdot(-\sin x) + 3x^2\cdot\cos x$

$\boxed{148:10}$ $D\,\dfrac{1-\sin x}{\cos x} = \dfrac{\cos x\cdot(-\cos x) - (1-\sin x)\cdot(-\sin x)}{\cos^2 x}$

$\boxed{148:12}$ $D(x^3\sec x) = x^3\cdot\sec x\tan x + 3x^2\cdot\sec x$

$\boxed{148:14}$ $D(3\csc x + 2\tan x) = {}^-3\csc x\cot x + 2\sec^2 x$

$\boxed{148:16}$ $D(x^2\cos x\cot x) = 2x\cdot\cos x\cot x$

$+\ x^2\cdot(-\sin x)\cdot\cot x + x^2\cos x\cdot(-\csc^2 x)$

$\boxed{148:18}$ $D\,\dfrac{x}{1+\sec x} = \dfrac{(1+\sec x)(1) - x\cdot\sec x\tan x}{(1+\sec x)^2}$

$\boxed{148:22}$ $f(x) = 3x^2\sin x - 6\sin x - x^3\cos x + 6x\cos x \longrightarrow$

$f'(x) = \cancel{3x^2\cos x} + \cancel{6x\sin x} - \cancel{6\cos x} + x^3\sin x$

$- \cancel{3x^2\cos x} + {}^-\cancel{6x\sin x} + \cancel{6\cos x} = x^3\sin x$

$\boxed{148:23}$ $f(x) = \tan x - x \longrightarrow$

$f'(x) = \sec^2 x - 1 = \tan^2 x$

$\boxed{148:28}$ $f(x) = \cos x,\ f'(x) = -\sin x$

a.) $f'\left(\frac{\pi}{4}\right) = {}^-\sin\frac{\pi}{4} = -\frac{\sqrt{2}}{2}$

b.) $f\left(\frac{-2\pi}{3}\right) = -\sin\left(\frac{-2\pi}{3}\right) = -\left(-\frac{\sqrt{3}}{2}\right) = \frac{\sqrt{3}}{2}$

c.) $f'(2) = -\sin 2 = {}^-0.909$

$\boxed{148:29}$ $f(x) = \tan x \rightarrow f'(x) = \sec^2 x$

a.) $f'(\frac{\pi}{4}) = \sec^2(\frac{\pi}{4}) = \dfrac{1}{\cos^2(\frac{\pi}{4})} = \dfrac{1}{(\frac{\sqrt{2}}{2})^2} = 2$

b.) $f'\left(\frac{\pi}{6}\right) = \sec^2\left(\frac{\pi}{6}\right) = \dfrac{1}{\cos^2(\frac{\pi}{6})} = \dfrac{1}{\left(\frac{\sqrt{3}}{2}\right)^2} = \dfrac{4}{3}$

c.) $f'(3) = \sec^2(3) = \dfrac{1}{\cos^2(3)} = 1.020$

$\boxed{148:33}$ a.) high : 3 cm.

b.) low : -3 cm.

c.) instantaneous velocity is

$Y' = 3\cos t$ so

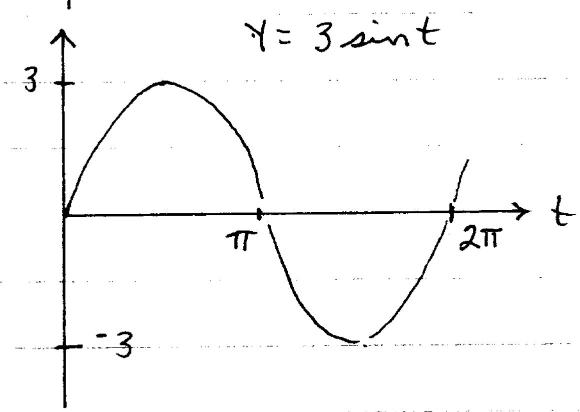
$Y'(0) = 3\cos 0 = 3$ cm./sec.,

$Y'(\pi) = 3\cos\pi = -3$ cm./sec

d.) speed = |velocity| so

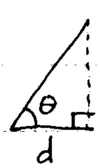
speed $= |Y'(0)| = 3$ cm./sec. and

speed $= |Y'(\pi)| = 3$ cm./sec.



$\boxed{148:36}$ $Y = \tan x \rightarrow Y' = \sec^2 x$

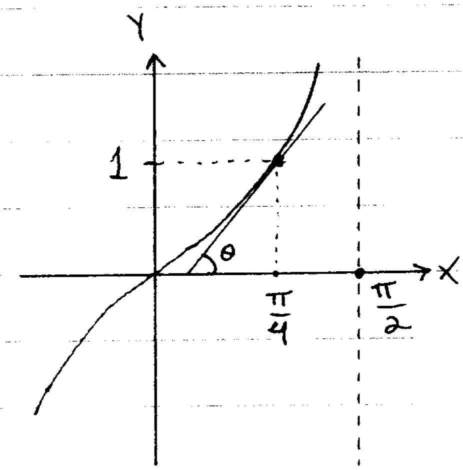
a.) at $x = \frac{\pi}{4}$ slope of tangent line is $Y'(\frac{\pi}{4}) = \sec^2(\frac{\pi}{4}) = 2$.

b.) 

$\dfrac{1}{d} = 2$ so $d = \frac{1}{2}$

then $\tan\theta = \dfrac{1}{\frac{1}{2}} = 2$

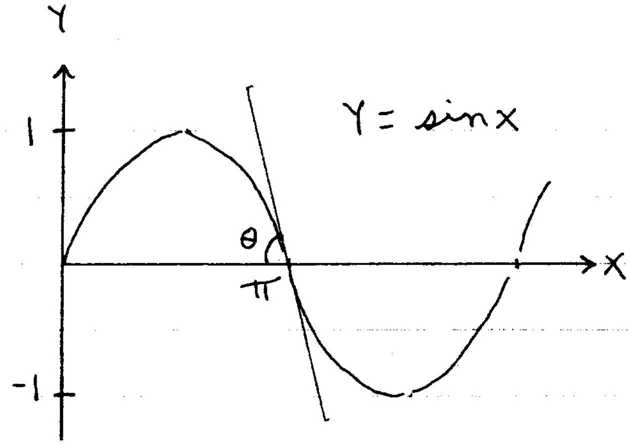
so $\theta \approx 1.107 = 63.4°$

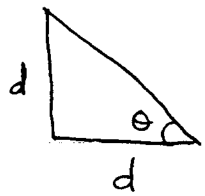


$\boxed{148:37}$ $Y' = \cos X$ so

$Y'(\pi) = \cos\pi = -1$

$= \text{slope} = \dfrac{\text{rise}}{\text{run}}$





so $\theta = \frac{\pi}{4} = 45°$

$\boxed{148:43}$ Let $f(x) = \cos X$ then

$$f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$$

$$= \lim_{h\to 0} \frac{\cos(x+h) - \cos x}{h}$$

$$= \lim_{h\to 0} \frac{\cos x\cdot\cos h - \sin x\cdot \sin h - \cos x}{h}$$

$$= \lim_{h\to 0}\left[\cos x\cdot \frac{\cos h - 1}{h} - \sin x\cdot\frac{\sin h}{h}\right]$$

$$= \cos x\cdot(0) - \sin x\cdot(1)$$

$$= -\sin x$$