HW 1-14 page 1

2.4 page 140 3, 7, 11, 15, 17, 21, 25, 29, 35, 37, 39, 41, 43, 47, 63, 65, 69, 71, 75, 79

$y = f(g(x))$

(3) $y = (6x-5)^4$ so $f(x) = x^4$ $g(x) = 6x-5$

(7) $y = \csc^3 x$ so $f(x) = x^3$ $g(x) = \csc x$

(11) $g(x) = 3(4-9x)^{5/6}$

$g'(x) = \frac{5}{2}(4-9x)^{-1/6}(-9) = -\frac{45}{2}(4-9x)^{-1/6}$

(15) $y = \sqrt[3]{6x^2+1} = (6x^2+1)^{1/3}$

$y' = \frac{1}{3}(6x^2+1)^{-2/3}(12x) = 4x(6x^2+1)^{-2/3}$

(17) $y = \frac{1}{x-2} = (x-2)^{-1}$ $y' = -1(x-2)^{-2}(1) = \frac{-1}{(x-2)^2}$

(21) $y = (3x+5)^{-1/2}$ $y' = -\frac{1}{2}(3x+5)^{-3/2}(3) = -\frac{3}{2}(3x+5)^{-3/2}$

(25) $y = x\sqrt{1-x^2} = x(1-x^2)^{1/2}$

$y' = x \cdot \frac{1}{2}(1-x^2)^{-1/2}(-2x) + (1)(1-x^2)^{1/2}$

$= \frac{-x^2}{\sqrt{1-x^2}} + \sqrt{1-x^2}$ or $\frac{-2x^2+1}{\sqrt{1-x^2}}$

(29) $g(x) = \left(\frac{x+5}{x^2+2}\right)^2$ $g'(x) = 2\left(\frac{x+5}{x^2+2}\right)\left(\frac{(x^2+2)-(x+5)(2x)}{(x^2+2)^2}\right)$

$= \left(\frac{2x+10}{x^2+2}\right)\left(\frac{-x^2-10x+2}{(x^2+2)^2}\right)$

(35) $y = \cos 4x$

$y' = (-\sin 4x)(4) = -4\sin 4x$

(37) $g(x) = 5\tan 3x$

$g'(x) = (5\sec^2 3x)(3) = 15\sec^2 3x$

(39) $y = \sin(\pi x)^2$ $y' = \cos(\pi x)^2 \, \pi 2(\pi x) = 2\pi^2 x\cos(\pi x)^2$

(41) $h(x) = \sin 2x \cos 2x$

$h'(x) = \sin 2x(-\sin 2x)2 + \cos 2x(\cos 2x)(2)$

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

$= 2(\cos^2 2x - \sin^2 2x) = 2\cos 4x$

(43) $f(x) = \dfrac{\cot x}{\sin x} = \dfrac{\cos x}{\sin^2 x}$

$f'(x) = \dfrac{\sin^2 x(-\sin x) - \cos x(2\sin x \cos x)}{\sin^4 x}$

$= \dfrac{-\sin^3 x - \cos^2 x(2\sin x)}{\sin^4 x}$

$= \dfrac{-\sin x(\sin^2 x + 2\cos^2 x)}{\sin^4 x} = \dfrac{-(1+\cos^2 x)}{\sin^3 x}$

$= \dfrac{-(\sin^2 x + \cos^2 x + \cos^2 x)}{\sin^3 x} = \dfrac{-(1+\cos^2 x)}{\sin^3 x}$

(47) $f(\theta) = \frac{1}{4}\sin^2 2\theta$

$f'(\theta) = \frac{1}{2}(\sin 2\theta)(\cos 2\theta)(2) = (\sin 2\theta)(\cos 2\theta)$

(63) $y = \sqrt{x^2+8x} = (x^2+8x)^{1/2}$

$y' = \frac{1}{2}(x^2+8x)^{-1/2}(2x+8) = \dfrac{x+4}{\sqrt{x^2+8x}}$

at $(1,3)$ the slope is $\dfrac{5}{\sqrt{1+8}} = \dfrac{5}{3}$

(65) $f(x) = 5(x^3-2)^{-1}$

$f'(x) = -5(x^3-2)^{-2}(3x^2) = \dfrac{-15x^2}{(x^3-2)^2}$

at $(-2, -\frac{1}{2})$ the slope is $\dfrac{-15(-2)^2}{(-8-2)^2} = \dfrac{-60}{100} = \dfrac{-3}{5}$

(69) $y = 26 - \sec^3 4x$

$y' = (-3\sec^2 4x)(\sec 4x \tan 4x)(4)$

$= -12 \sec^3 4x \tan 4x$ at $(0,25)$ the slope is $0$ $(\tan 0 = 0)$

2.4

# HW 1-14 page 3

(71) $f(x) = \sqrt{2x^2-7}$ tangent line at $(4,5)$

$$f'(x) = \frac{1}{2}(2x^2-7)^{-1/2}(4x) = \frac{2x}{\sqrt{2x^2-7}}\Big|_{x=4} = \frac{8}{\sqrt{25}} = \frac{8}{5}$$

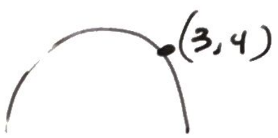
$$y-5 = \frac{8}{5}(x-4)$$ Confirm w/ calc.

(75) $f(x) = \sin 8x$ – tan line at $(\pi, 0)$

$$f'(x) = 8\cos 8x\Big|_{x=\pi} = 8\cos 8\pi = 8$$

$$y = 8(x-\pi)$$

(79)




$$f(x) = \sqrt{25-x^2}$$

$$f'(x) = \frac{1}{2}(25-x^2)^{-1/2}(-2x)$$

$$f'(x) = \frac{-x}{\sqrt{25-x^2}}$$

$$f'(3) = \frac{-3}{\sqrt{16}} = -\frac{3}{4}$$

tangent line at $(3,4)$ is

$$y-4 = \frac{-3}{4}(x-3)$$