p.104 57. $y = A\sin x + B\cos x$

$y' = A\cos x - B\sin x$

$y'' = -A\sin x - B\cos x$

$y'' + y' - 2y - \sin x = 0$

$(-A - B - 2A - 1)\sin x + (-B + A - 2B)\cos x = 0$

$-3A - B - 1 = 0$

$-3B + A = 0$

$A = 3B$

$-10B = 1 \quad B = -\frac{1}{10} \quad A = -\frac{3}{10}$

$$y = -\frac{3}{10}\sin x - \frac{1}{10}\cos x$$

58. $y = Ax^2 + Bx + C$

$y' = 2Ax + B$

$y'' = 2A$

$y'' + y' - 2y = x^2$

$2A + 2Ax + B - 2Ax^2 - 2Bx - 2C - x^2 = 0$

$(-2A - 1)x^2 + (2A - 2B)x + 2A + B - 2C = 0$

$-2A - 1 = 0 \Rightarrow A = -1/2$

$2A - 2B = 0 \Rightarrow B = -1/2$

$2A + B - 2C = 0 \Rightarrow C = -3/4$

$$y = -\tfrac{1}{2}x^2 - \tfrac{1}{2}x - \tfrac{3}{4}$$

p. 111

3 $g(t) = t^3 \cos t \quad g'(t) = 3t^2 \cos t - t^3 \sin t$

4. $f(x) = \sqrt{x} \sin x \quad f'(x) = \sqrt{x} \cos x + \frac{1}{2\sqrt{x}} \sin x$

6. $V(u) = (u^{-2} + u^{-3})(u^5 - 2u^2)$

$= u^3 - 2 + u^2 - 2u^{-1}$

$V'(u) = 3u^2 + 2u + 2u^{-2}$ or can use product rule

30. $y = (1+x)\cos x$

$y' = -(1+x)\sin x + \cos x$ point $(0,1)$

slope $= -(1+0)\sin 0 + \cos 0 = 1$

so ~~$y = 1$~~ ~~horizontal tangent~~

$y - 1 = x$

35. $H(\theta) = \theta \sin \theta$

$H'(\theta) = \theta \cos \theta + \sin \theta$

$H''(\theta) = -\theta \sin \theta + \cos \theta + \cos \theta = -\theta \sin \theta + 2\cos \theta$

53.

a. $fgh = (fg)h$ so

$(fgh)' = (fg)'h + fgh'$ by product rule

$= (fg' + f'g)h + fgh'$ " " "

$= fg'h + f'gh + fgh'$

b. $y = x \sin x \cos x$

$y' = \sin x \cos x + x\cos^2 x - x\sin^2 x$

:111

12. $f(t) = \frac{2t}{4+t^2}$ $\quad f'(t) = \frac{(4+t^2)(2) - 2t(2t)}{(4+t^2)^2} = \frac{8-2t^2}{(4+t^2)^2}$

16. $y = \frac{\sqrt{x}-1}{\sqrt{x}+1}$ $\quad y' = \frac{(\sqrt{x}+1)\frac{1}{2\sqrt{x}} - (\sqrt{x}-1)(\frac{1}{2\sqrt{x}})}{(\sqrt{x}+1)^2}$

18. $y = \frac{cx}{1+cx}$ $\quad y' = \frac{(1+cx)c - cx(c)}{(1+cx)^2} = \frac{1}{(1+cx)^2}$

23. $y = \frac{\sin x}{x^2}$ $\quad y' = \frac{x^2\cos x - 2x\sin x}{x^4} = \frac{x\cos x - 2\sin x}{x^3}$

32a. $y = \frac{x}{1+x^2}$ $\quad y' = \frac{(1+x^2)(1) - x(2x)}{(1+x^2)^2} = \frac{1-x^2}{(1+x^2)^2}$

point: $(3, .3)$

slope: $\frac{1-9}{100} = -.08$

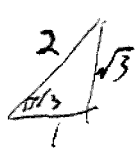
$y - .3 = -.08(x-3)$

40. $g(x) = f(x)\sin x$

$g'(x) = f(x)\cos x + f'(x)\sin x$

$g'(\pi/3) = f(\pi/3)\cos(\pi/3) + f'(\pi/3)\sin(\pi/3)$

$= 4 \cdot \frac{1}{2} + (-2)\frac{\sqrt{3}}{2} = 2 - \sqrt{3}$



40b $h(x) = \frac{\cos x}{f(x)}$ $h'(x) = \frac{f(x)(-\sin x) - \cos x f'(x)}{(f(x))^2}$

$h'(\pi/3) = \frac{4 \cdot (-\frac{\sqrt{3}}{2}) - \frac{1}{2}(-2)}{16} = \boxed{\frac{-2\sqrt{3}+1}{16}}$

42. a. -1 b. $(fg)'(3) = f'(3)g(3) + f(3)g'(3)$
$= (6)(2) + 4(5) = \boxed{8}$

c. $\left(\frac{f}{g}\right)'(3) = \frac{g(3)f'(3) - f(3)g'(3)}{(g(3))^2} = \frac{2 \cdot |-6| - 4 \cdot 5}{4}$
$= \boxed{-8}$

p. 119

3. $y = (1-x^2)^{10}$ $g(x) = 1-x^2$ $f(x) = x^{10}$

$$\frac{dy}{dx} = 10(1-x^2)^9(-2x)$$

4. $y = \tan(\sin x)$ $g(x) = \sin x$ $f(x) = \tan x$

$$\frac{dy}{dx} = \sec^2(\sin x) \cdot \cos x$$

7. $F(x) = (1+2x+x^3)^{1/4}$

$$F'(x) = \frac{1}{4}(1+2x+x^3)^{-3/4} \cdot (2+3x^2)$$

10. $f(t) = (1+\tan t)^{1/3}$

$$f'(t) = \frac{1}{3}(1+\tan t)^{-2/3} \sec^2 t$$

14. $y = 4\sec 5x$ $y' = 4 \cdot \sec(5x)\tan 5x \cdot 5$

16. $h(t) = (t^4-1)^3(t^3+1)^4$

$$h'(t) = 3(t^4-1)^2 \cdot 4t^3(t^3+1)^4 + (t^4-1)^3 \cdot 4(t^3+1)^3 3t^2$$

23. $F(z) = \sqrt{\frac{z-1}{z+1}}$

$$F'(z) = \frac{1}{2\sqrt{\frac{z-1}{z+1}}} \cdot \left(\frac{2}{(z+1)^2}\right)$$

26. $y = \frac{\sin^2 x}{\cos x}$ $\quad y' = \frac{\cos x \cdot 2\sin x \cos x + \sin^3 x}{\cos^2 x}$

29. $y = \sin(\sqrt{1+x^2})$ $\quad y' = \cos(\sqrt{1+x^2}) \cdot \frac{1}{2\sqrt{1+x^2}} \cdot 2x$

34. $y = \sin(\sin(\sin x))$

$y' = \cos(\sin(\sin x)) \cdot \cos(\sin x) \cdot \cos x$

40. $y = \sin x + \sin^2 x$ at $(0,0)$

$y' = \cos x + 2\sin x \cos x$

$y'(0) = 1 + 0$

$\boxed{y = x}$

44. $h(x) = \sqrt{x^2+1}$ $\quad h'(x) = \frac{1}{2\sqrt{x^2+1}} \cdot 2x = \frac{x}{\sqrt{x^2+1}}$

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

48. $h'(x) = \frac{1}{2\sqrt{4+3f(x)}} \cdot 3f'(x)$

$h'(1) = \frac{1}{2\sqrt{4+2}} \cdot 3 \cdot 4 = \frac{12}{10} = \frac{6}{5}$

49a. $h'(1) = f'(g(1)) \cdot g'(1) = f'(2) \cdot 6 = 30$

b. $H'(1) = g'(f(1)) \cdot f'(1) = g'(3) \cdot 4 = 36$

50. a $f'(f(2)) \cdot f'(2) = f'(1) \cdot 5 = 20$

b $g'(g(3)) \cdot g'(3) = g'(2) \cdot 9 = 7 \cdot 9 = 63$