Sec. 3.2 | 3.3

p. 140 #50–53

(50) $f(x) = 12x - x^3$ $\quad (2, 16)\ (-2, -16)$

$f'(x) = 12 - 3x^2 = 0$

$-3x^2 = -12$

$x^2 = 4$

$x = \pm 2$

(51) $y = x^2 + 3x - 7$ $\quad \left(\frac{1}{2}, -\frac{31}{4}\right)$ or $(.5, -5.25)$

$y' = 2x + 3 = 4$

$2x = 1$

$x = \frac{1}{2}$

(52) $y = x^3$ $\quad y = x^2 + 5x$

$y' = 3x^2$ $\quad y' = 2x + 5$

$3x^2 = 2x + 5$

$3x^2 - 2x - 5 = 0$

$x^2 - 2x - 15 = 0$

$(x - \frac{5}{3})(x + \frac{3}{3}) = 0$

(53) $p(1) = 0 \quad p'(1) = 4$

$(3x - 5)(x + 1) = 0$

$x = \frac{5}{3} \quad x = -1$

$y = x^2 + ax + b$

$y' = 2x + a$ when $x = 1$ $y' = 4$

$4 = 2(1) + a$

$4 = 2 + a$

$2 = a$ Do

$y = x^2 + 2x + b$ contains the pt $(1, 0)$

$0 = 1 + 2 + b$

$0 = 3 + b$

$-3 = b$

p. 147 # 17, 19, 21, 23, 39-43

(17) $f'(x) = (x^3+5)(3x^2+1) + (x^3+x+1)(3x^2)$

$3x^5 + x^3 + 15x^2 + 5 + 3x^5 + 3x^3 + 3x^2$

$f'(x) = 6x^5 + 4x^3 + 18x^2 + 5$

(19) $y' = \frac{(x+10)(0) - (1)(1)}{(x+10)^2} = \frac{-1}{(x+10)^2}\Big|_{x=3}$ $\frac{-1}{13^2} = \frac{-1}{169}$

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

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

(23) $y' = \frac{(x^2-5)(4x^3) - (x^4-4)(2x)}{(x^2-5)^2}\Big|_{x=2}$

$\frac{(4-5)\cdot 4(8) - (16-4)(4)}{(4-5)^2} = \frac{-80}{1} = -80$

(39) $f(x)\,g'(x) + g(x)\,f'(x)$

$f(4)\,g'(4) + g(4)\,f'(4)$

$10 \cdot -1 + 5 \cdot -2$

$-10 + -10 = -20$

$\frac{g(x)f'(x) - f(x)g'(x)}{(g(x))^2}$

$\frac{g(4)f'(4) - f(4)g'(4)}{(g(4))^2}$

$\frac{5(-2) - 10(-1)}{(5)^2}$

$\frac{-10+10}{25} = 0$

(40) $F'(4)$ $\quad F'(x) = x^2 f'(x) + f(x)\,2x$

$F'(4) = 4^2 f'(4) + f(4)\,2(4)$

$16 \cdot -2 + 10 \cdot 8$

$-32 + 80 = 48$

(41) $G'(x) = g(x)\,g'(x) + g(x)\,g'(x)$

$g(4)\,g'(4) + g(4)\,g'(4)$

$5 \cdot -1 + 5 \cdot -1$

$-5 + -5 = -10$

(42) $H'(x) = \dfrac{g(x)f(x)\cdot 1 - x\left(g(x)f'(x) + f(x)\,g'(x)\right)}{(g(x)\,f(x))^2}$

$\dfrac{g(4)f(4) - 4\left(g(4)\,f'(4) + f(4)g'(4)\right)}{(g(4)\,f(4))^2}$

$\dfrac{5\cdot 10 - 4(5\cdot -2 + 10\cdot -1)}{(5\cdot 10)^2} = \dfrac{50 - 4(-10 + -10)}{(50)^2}$

$= \dfrac{130}{2500} = \dfrac{13}{250}$

(43) $F(x) = \dfrac{f(x)}{g(x)}$ $\quad F'(x) = \dfrac{g(x)\,f'(x) - f(x)\,g'(x)}{(g(x))^2}$

$f(0) = 0$

$g(0) = 1$

$f'(x) = 9x^8 + 8x^7 + 20x^4 - 7$

$f'(0) = -7$

$g'(x) = 4x^3 - 6x + 2$

$g'(0) = 2$

$F'(0) = \dfrac{g(0)\,f'(0) - f(0)\,g'(0)}{(g(0))^2}$

$= \dfrac{1(-7) - 0(2)}{1^2} = -7$