3.3 (cont)

27 $y = \frac{x^3+1}{2x}$ f, $x = 1$ (1, 1)

g,

$$\frac{3x^2(2x) - 2(x^3+1)}{(2x)^2}$$

$$\frac{3\cdot 2 - 2\cdot 2}{4} \qquad \frac{6-4}{4} = \frac{2}{4} = \frac{1}{2}$$

$y = mx + b$

$1 = \frac{1}{2}(1) + b$

$-\frac{1}{2} \quad -\frac{1}{2}$

$\frac{1}{2} = b$ $\boxed{y = \frac{1}{2}x + \frac{1}{2}}$

31 $y = \frac{\sqrt{x} - 1}{\sqrt{x} + 1} = \frac{x^{1/2} - 1}{x^{1/2} + 1}$ f

g

$$\frac{\frac{1}{2}x^{-1/2}(x^{1/2}+1) - \frac{1}{2}x^{-1/2}(x^{1/2}-1)}{(x^{1/2}+1)^2}$$

$$\frac{\left(\frac{1}{2} + \frac{1}{2}x^{-1/2}\right) - \left(\frac{1}{2} - \frac{1}{2}x^{-1/2}\right)}{(x^{1/2}+1)^2}$$

$$\frac{x^{-1/2}}{(x^{1/2}+1)^2} = \frac{1}{\sqrt{x}\,(\sqrt{x}+1)^2}$$

3.3 (cont)

30] $y = \frac{1}{4}x^{-4} - \frac{1}{3}x^{-3} + \frac{1}{2}x^{-2} - x^{-1} + 3$

$\frac{dy}{dx} = -x^{-5} + x^{-4} - x^{-3} + x^{-2}$

24d] $u(2) = 3,\ u'(2) = -4,\ v(2) = 1,\ v'(2) = 2$

$\frac{d}{dx}(3u - 2v + 2uv)$ (f, g)

$3u'(2) - 2v'(2) + 2[u'v + v'u]$

$3(-4) - 2(2) + 2[-4 \cdot 1 + 2 \cdot 3]$

$-12 - 4 + 2[-4 + 6]$

$-12 - 4 + 4 = -12$

51] TOTAL ANNUAL PRODUCTION = # TREES $\times$ $\frac{\text{BUSHELS}}{\text{TREE}}$

$= (13)(12) + (1.5)(130)$

$= 390$ bushels/year

3.3 (cont)

19) $y = \dfrac{(x-1)(x^2+x+1)}{x^3}$

$x^3 + x^2 + x$
$-x^2 - x - 1$
$x^3 - 1$

$y = \dfrac{x^3-1}{x^3}$ f / g

$y' = \dfrac{3x^2 \cdot x^3 - 3x^2(x^3-1)}{(x^3)^2}$

$= \dfrac{3x^5 - 3x^5 + 3x^2}{x^6}$

$= \dfrac{3x^2}{x^6} = \dfrac{3}{x^4}$

OR

$y = \dfrac{x^3}{x^3} - \dfrac{1}{x^3}$

$y = 1 - x^{-3}$

$y = 3x^{-4} = \dfrac{3}{x^4}$

3.3 (cont)

38 $y = x^3 + x$

$y' = 3x^2 + 1 = 4$

$3x^2 = 3$

$x^2 = 1$

$x = \pm 1$

$m = 4 \quad (-1, -2)$

$y = mx + b$

$-2 = 4(-1) + b$

$-2 = -4 + b$

$2 = b$

$\boxed{y = 4x + 2}$

$m = 4 \quad (1, 2)$

$y = mx + b$

$2 = 4(1) + b$

$2 = 4 + b$

$-2 = b$

$\boxed{y = 4x - 2}$

58 $f(x) = (x^2 - 1)(x^2 + 1)$

$= x^4 - 1$

$f'(x) = 4x^3$

3.3

38 $y = x^3 + x$ $\quad m = 4$ $\quad (-1,-2)$ $\quad (1,2)$

$y' = 3x^2 + 1 = 4$

$3x^2 = 3$

$x^2 = 1$

$x = \pm 1$

$y = mx + b$

$-2 = 4(-1) + b$

$-2 = -4 + b$

$2 = b$

$\boxed{y = 4x + 2}$

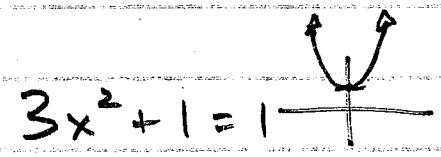
$y = mx + b$

$2 = 4(1) + b$

$2 = 4 + b$

$-2 = b$

$\boxed{y = 4x - 2}$



$3x^2 + 1 = 1$

$3x^2 = 0$

$x^2 = 0$

$x = 0$

14 $y = \dfrac{x^2+3}{x}$ $\quad$ (f / q)

$y' = \dfrac{2x(x) - (x^2+3)}{x^2}$

$= \dfrac{2x^2 - x^2 - 3}{x^2}$

$= \dfrac{x^2 - 3}{x^2}$

$= 1 - \dfrac{3}{x^2}$

$y = \dfrac{x^2+3}{x}$

$y = \dfrac{x^2}{x} + \dfrac{3}{x}$

$y = x + 3x^{-1}$

$y = 1 - 3x^{-2}$

$= 1 - \dfrac{3}{x^2}$

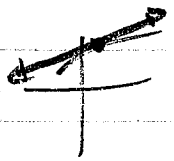
3.3

23 (a) $\frac{d}{dx}(uv) = u'v + v'u$

$= (-3)(-1) + (2)(5) = \boxed{13}$

(b) $\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{u'v - v'u}{v^2} = \frac{(-3)(-1) - (2)(5)}{(-1)^2} = \boxed{-7}$

27 $y = \frac{x^3+1}{2x}$, $x = 1$ $\quad (1,1)$ $\quad f, g$



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

$y'(1) = \frac{6-4}{4} = \frac{1}{2} = m$

$y = mx + b$

$1 = \frac{1}{2}(1) + b$

$+\frac{1}{2} = b$

$\boxed{y = \frac{1}{2}x + \frac{1}{2}}$

37 $y = x^3 - 3x + 1$ $\quad (2,3)$ $\quad m = -\frac{1}{9}$

$y' = 3x^2 - 3$

$y'(2) = 3(2)^2 - 3 = 9$

$y = mx + b$

$3 = -\frac{1}{9}(2) + b$

$3 = -\frac{2}{9} + b$

$\frac{29}{9} = b$

$\boxed{y = -\frac{1}{9}x + \frac{29}{9}}$

39 $y = 2x^3 - 3x^2 - 12x + 20$

$y' = 6x^2 - 6x - 12 = 0 \quad \rightarrow \quad \frac{6(x^2 - x - 12)}{6} = \frac{0}{6}$

$x^2 - x - 2 = 0$

$(x-2)(x+1) = 0$

$x = 2 \quad x = -1$

$y(2) = 0 \quad (2,0)$

$y(-1) = 27 \quad (-1,27)$

$\frac{f'g - g'f}{g^2}$