

3.3

$$48) R = m^2 \left(\frac{c}{2} - \frac{m}{3} \right)$$

$$= \frac{c}{2} m^2 - \frac{1}{3} m^3$$

$$\frac{dR}{dm} = cm - m^2$$

$$R = m^2 \left(\frac{c}{2} - \frac{m}{3} \right)$$

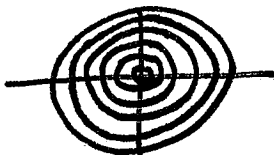
$$\frac{dR}{dm} = 2m \left(\frac{c}{2} - \frac{m}{3} \right) + \frac{-1}{3} m^2$$

$$= cm - \frac{2}{3} m^2 - \frac{1}{3} m^2$$

$$= cm - m^2$$

$$49) A = \pi r^2$$

$$\frac{dA}{dr} = 2\pi r = C$$



$$50) V = \frac{4}{3} \pi r^3$$

$$\frac{dV}{dr} = 4\pi r^2$$

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

$$= \frac{x^3}{x^3} - \frac{1}{x^3}$$

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

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

$$23) u(0) = 5, u'(0) = -3, v(0) = -1, v'(0) = 2$$

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

$$= -3 \cdot -1 + 2 \cdot 5$$

$$= 3 + 10 = 13$$

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

$$= 3u$$

$$(d) \frac{d}{dx} = 7v - 2u$$

$$= 7v' - 2u'$$

$$= 7(2) - 2(-3)$$

$$= 14 + 6 = 20$$

19) (AGAIN) $\frac{3.3 \quad f}{(x-1)(x^2+x+1)}$

$$\frac{x^3 - 1}{x^3}$$

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

$$\frac{x^2 \cdot x^3 = x^5}{x \cdot x \cdot x \cdot x \cdot x}$$

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

$$(x^2)^3 = x^6$$

$$(x \cdot x)(x \cdot x)(x \cdot x)$$

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

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

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

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

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

52) share = $\frac{\text{cost}}{\text{members}}$

$$\frac{d \text{ share}}{d \text{ time}} = \frac{d \text{ cost} \cdot \text{members} - d \text{ members} \cdot \text{cost}}{(\text{members})^2}$$

$$= \frac{10 \cdot 65 - 6 \cdot 250}{(65)^2}$$

3.3

$$14) (a) y = \frac{x^2+3}{x} g$$

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

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

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

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

$$(b) y = x + 3x^{-1}$$

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

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

3.3

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

$$\frac{z}{2} \quad (1, 1)$$

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

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

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

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

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

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

$$x \cdot x \cdot x \cdot x \cdot x$$

$$x^2 \cdot x^3 = x^5$$

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

$$(x^2)^3 = x^6$$

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

$$x^2 \cdot x^2 \cdot x^2$$

$$= \frac{3x^2}{x^6} = \boxed{\frac{3}{x^4}}$$

$$x \cdot x \cdot x \cdot x \cdot x \cdot x$$

$$3.3 \frac{1}{x}$$

35)

$$\begin{aligned} y &= x^{-1} + x^2 \\ y' &= -x^{-2} + 2x \\ y'' &= 2x^{-3} + 2 \\ y''' &= -6x^{-4} \\ y^{(4)} &= 24x^{-5} \end{aligned}$$

23)

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

$$(-3)(-1) + (2)(5)$$

$$3 + 10 = \boxed{13} \quad 3 - 10$$

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

$$(d) \frac{d}{dx}(7v - 2u) = 7v' - 2u' = 7(2) - 2(-3) = \boxed{20}$$

37)

$$\begin{aligned} y &= x^3 - 3x + 1, \quad (2, 3) \\ y' &= 3x^2 - 3 \\ y'(2) &= 3(2)^2 - 3 = 9 \\ m &= \frac{1}{9} \end{aligned}$$

$$y - 3 = \frac{1}{9}(x - 2)$$

21)

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

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

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

3.3

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

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

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

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

$$32) y = \frac{x^{-4}}{4} - \frac{x^{-3}}{3} + \frac{x^{-2}}{2} - x^{-1} + 3$$

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

$$y' = -x^{-5} + x^{-4} - x^{-3} + x^{-2}$$

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

$$= x^4 - 1$$

$$f'(x) = 4x^3 = 0$$