

$$1) \quad 2 \left( \frac{x+1}{2x^2-1} \right) \cdot \frac{-2x^2-4x-1}{(2x^2-1)^2}$$

$$= \frac{2(-2x^3-6x^2-5x-1)}{(2x^2-1)^3}$$

$$= \frac{-4x^3-12x^2-10x-2}{(2x^2-1)^3}$$

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

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

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

$$= \frac{-2x^3-6x^2-5x-1}{(2x^2-1)^3}$$

$$2) \quad 4x^3y^2 + 2x^4y \frac{dy}{dx} = y^3 + 3xy^2 \frac{dy}{dx}$$

$$\frac{dy}{dx} = \frac{y^3 - 4x^3y^2}{2x^4y - 3xy^2} = \frac{y^2 - 4x^3y}{2x^4 - 3xy}$$

$$3) \quad \frac{dSA}{dt} = 12s \frac{ds}{dt}$$

$$s = 7 \text{ cm}$$

$$\frac{ds}{dt} = 6 \frac{\text{cm}}{\text{sec}}$$

$$\frac{dSA}{dt} = 12(7 \text{ cm})(6 \frac{\text{cm}}{\text{sec}})$$

$$\frac{dSA}{dt} = 504 \frac{\text{cm}^2}{\text{sec}}$$

$$4) \quad \frac{r}{h} = \frac{3}{5}$$

$$V = \frac{4}{3} \pi r^2 h$$

$$h = 3.5$$

$$r = \frac{3h}{5}$$

$$V = \frac{4}{3} \pi \left( \frac{3h}{5} \right)^2 h$$

$$\frac{dV}{dt} = 4 \frac{\text{m}^3}{\text{min}}$$

$$V = \frac{12\pi}{25} h^3$$

$$\frac{dV}{dt} = \frac{12\pi}{25} (3h^2 \frac{dh}{dt})$$

$$\frac{dV}{dt} = \frac{36\pi h^2}{25} \frac{dh}{dt}$$

$$\frac{25}{36\pi h^2} \frac{dV}{dt} = \frac{dh}{dt}$$

$$\frac{25}{36\pi (3.5 \text{ m})^2} \cdot \frac{4 \text{ m}^3}{\text{min}} = \frac{dh}{dt}$$

$$.072 \frac{\text{m}}{\text{min}} = \frac{dh}{dt}$$

$$5) y^2 x = x^2 - xy$$

$$2xy \frac{dy}{dt} + y^2 \frac{dx}{dt} = 2x \frac{dx}{dt} - \left( y \frac{dx}{dt} + x \frac{dy}{dt} \right)$$

$$\frac{dy}{dt} (2xy + x) = (2x - y - y^2) \frac{dx}{dt}$$

$$\frac{dy}{dt} = \frac{2x - y - y^2}{2xy + x} \cdot \frac{dx}{dt}$$

$$\frac{dy}{dt} = \frac{2(2) - (-1) - (-1)^2}{2(2)(-1) + 2} (0.5)$$

$$= \frac{2}{-2} \cdot 0.5$$

$$\frac{dy}{dt} = -0.5$$

$$6) 2x + 2y \frac{dy}{dx} = 0$$

$$\frac{dy}{dx} = -\frac{x}{y}$$

$$m_T = -\frac{5}{3}$$

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

→

$$\frac{d}{dx} h(x) = \frac{d}{dx} f(g(x)) = f'(g(x)) \cdot g'(x)$$

$$\therefore h'(3) = f'(g(3)) \cdot g'(3)$$

$$= f'(5) \cdot (-3)$$

$$= 7 \cdot (-3)$$

$$= -21$$

Substitute these values in appropriately

given

$$\begin{cases} g(3) = 5 \\ g'(3) = -3 \\ f'(5) = 7 \\ f(3) = 9 \end{cases}$$