

Q1

$$a) \quad i) \quad y = \frac{x^2}{2x+1} \quad u = x^2 \quad v = 2x+1$$

$$\frac{du}{dx} = 2x \quad \frac{dv}{dx} = 2$$

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

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

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

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

$$ii) \quad y = \sqrt{x^2+1} \quad > \quad y = (x^2+1)^{\frac{1}{2}} \quad u = x^2+1$$

$$y = u^{\frac{1}{2}} \quad \frac{du}{dx} = 2x$$

$$\frac{dy}{dx} = \frac{1}{2} u^{-\frac{1}{2}} \cdot 2x$$

$$\frac{dy}{dx} = \frac{1}{2} u^{-\frac{1}{2}} \cdot 2x$$

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

$$iii) \quad y = 3x^{\frac{3}{2}} + \frac{3}{x^2} + 6x$$

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

$$\frac{dy}{dx} = \frac{9}{2}x^{\frac{1}{2}} - 6x^{-3} + 6$$

$$iv) \quad y = \sec^3 4x$$

$$\frac{dy}{dx} = 3 \sec^2 4x \cdot \tan 4x \cdot 4$$

$$= 12 \sec^2 4x \cdot \tan 4x$$