

1ai.

$$\frac{x^2}{2x+1} = y.$$

$$u(x) = x^2$$

$$u'(x) = 2x$$

$$v(x) = 2x+1$$

$$v'(x) = 2$$

$$\frac{dy}{dx} = \frac{du \cdot v - u \cdot dv}{v^2}$$

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

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

ii

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

$$u = x^2 + 1$$

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

$$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du}$$

$$y = u^{1/2}$$
$$\frac{dy}{du} = \frac{1}{2} u^{-1/2}$$

$$\text{So, } \frac{dy}{dx} = \frac{1}{2} u^{-1/2} \times 2x$$

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