

$$11. f(x) = e^{3x+1}$$

$$f'(x) = 3e^{3x+1}$$

$$f''(x) = 9e^{3x+1}$$

$$f'''(x) = 27e^{3x+1}$$

$$111. (a) y = 9^{\ln x} = e^{\ln(x) \ln(9)}, u = \ln(x) \ln(9)$$

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx} = e^u \cdot \frac{\ln(9)}{x}$$

$$= e^{\ln(x) \ln(9)} \cdot \frac{\ln(9)}{x}$$

$$= \frac{\ln(9) \cdot 9^{\ln(x)}}{x}$$

$$(b) y = \log \left(\frac{x^2+1}{x^3+4} \right), u = \frac{x^2+1}{x^3+4}, y = \ln(u)$$

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx} = \frac{1}{u} \left(\frac{(x^3+4)(2x) - (x^2+1)(3x^2)}{(x^3+4)^2} \right)$$

$$= \frac{x^3+4}{x^2+4} \left(\frac{-x^4-3x^2+8x}{(x^3+4)^2} \right)$$

$$= \frac{-x^4-3x^2+8x}{(x^2+4)(x^3+4)}$$

$$(c) y^2 = x^3 - 4y + 1$$

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

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

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

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