

1) Find the derivative of $f(x) = 2^x(x^3 + 5x)$

Use the product rule:

$$f'(x) = 2^x \ln(2)(x^3 + 5x) + 2^x(3x^2 + 5)$$

2) Find $\frac{d}{dx} \frac{x3^x}{x^2+2}$

Use the quotient rule, and the product rule for the numerator:

$$\frac{d}{dx} \frac{x3^x}{x^2+2} = \frac{(3^x + x3^x \ln(3))(x^2 + 2) + x3^x(2x)}{(x^2 + 2)^2}$$

3) Let $f(x) = \sqrt{x} + x^{\frac{5}{4}}$. Find $f'(x)$.

First write the square root as a fractional exponent:

$$f(x) = x^{\frac{1}{2}} + x^{\frac{5}{4}}$$

$$f'(x) = \frac{1}{2}x^{-\frac{1}{2}} + \frac{5}{4}x^{\frac{1}{4}} = \frac{1}{2\sqrt{x}} + \frac{5}{4}\sqrt[4]{x}$$