Problem 1.

Find f'(x) (Power Rule)

$$f(x) = 3x^{2025} - \frac{3x^2}{5} + x - \sqrt{x} + \frac{\sqrt[3]{x}}{4} + \frac{1}{x} - \frac{1}{x^4} + 1$$

(Rewrik f(x)) $f(x) = 3x^{2025} - \frac{3x^2}{5} + x - x^{\frac{1}{2}} + \frac{x^{\frac{1}{3}}}{4} + x^{-1} - x^{-4} + 1$

(taking derivative)

$\Rightarrow f'(x) = 3 \cdot 2025 \cdot x^{2024} - \frac{3 \cdot 2 \cdot x^{2-1}}{5} + 1 - \frac{1}{2}x^{\frac{1}{2}-1} + \frac{\frac{1}{3}x^{\frac{1}{3}-1}}{4} - 1 \cdot x^{-1-1} - (-4) x^{-4-1}$

$= 6075 x^{2024} - \frac{6x}{5} + 1 - \frac{1}{2}x^{-\frac{1}{2}} + \frac{\frac{1}{3}x^{-\frac{2}{3}}}{4} - x^{-2} + 4x^{-5}$

Problem 2

Find f'(x) (Log Rule)

$$f(x) = 3\log_{2025} x - \frac{\ln x}{5} + 5\log_7 x + 1$$

$\Rightarrow f'(x) = 3 \cdot \frac{1}{x \ln 2025} - \frac{\frac{1}{x}}{5} + 5 \cdot \frac{1}{x \cdot \ln 7}$

Problem 3

Find f'(x) (Exponential Rule)

$$f(x) = e^x - 2025^x - \frac{8^x}{7} + 2025$$

$f'(x) = e^x - 2025^x \cdot \ln 2025 + \frac{8^x \cdot \ln 8}{7}$

Problem 4

Find f'(x) (Product Rule)

$$f(x) = x^2 e^x$$

$$f'(x) = (x^2)' \cdot e^x + (e^x)' \cdot x^2$$

$$= 2x\, e^x + e^x \cdot x^2$$

Problem 5

Find f'(x) and simplify (Quotient Rule)

$$\frac{x^2 + 1}{x^2 - 1}$$

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

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

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

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