

$$f(t) = \sqrt{\frac{1}{t^2 - 6}} = \left(\frac{1}{t^2 - 6}\right)^{1/2}$$

$$u = t^2 - 6 \quad du = 2t$$

$$f(t) = \frac{1^{1/2}}{u^{1/2}} = \frac{1}{u^{1/2}} = u^{-1/2}$$

$$f'(t) = -\frac{1}{2} u^{-3/2} \cdot du = -\frac{1}{2} (t^2 - 6)^{-3/2} (2t)$$

$$\boxed{-t(t^2 - 6)^{-3/2}}$$

$$y = x^3 (x-4)^4$$

• must use product rule

$$x^3 \cdot 4(x-4)^3 \cdot (1) + (x-4)^4 \cdot 3x^2$$

$$4x^3(x-4)^3 + 3x^2(x-4)^4$$

$$(x-4)^3 x^2 (4x + 3(x-4))$$

$$\boxed{x^2(x-4)^3(7x-12)}$$

$$y = 2x(x^2-3)^5 \quad \text{product rule}$$

$$y' = 2x \cdot 5(x^2-3)^4(2x) + (x^2-3)^5 \cdot 2$$

$$20x^2(x^2-3)^4 + 2(x^2-3)^5$$

$$2(x^2-3)^4(10x^2 + x^2-3)$$

$$\boxed{2(x^2-3)^4(11x^2-3)}$$

$$y = x^{1/2}$$

$$y' = \frac{1}{2} x^{-1/2}$$

$$y = x \sqrt{1-x^2}$$

$$y = x (1-x^2)^{1/2}$$

PRODUCT!

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

$$- x^2 (1-x^2)^{-1/2} + (1-x^2)^{1/2}$$

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

$$\frac{-x^2 + 1 - x^2}{\sqrt{1-x^2}} = \boxed{\frac{-2x^2 - 1}{\sqrt{1-x^2}}}$$

$$y = x^2 \sqrt{9-x} = x^2 (9-x)^{1/2}$$

$$y' = x^2 \cdot \frac{1}{2} (9-x)^{-1/2} (-1) + 2x (9-x)^{1/2}$$

$$= \frac{-x^2}{2(9-x)^{1/2}} + 2x(9-x)^{1/2} \cdot \frac{2(9-x)^{1/2}}{2(9-x)^{1/2}}$$

$$\frac{-x^2 + 4x(9-x)}{2\sqrt{9-x}} = \frac{-x^2 + 36x - 4x^2}{2\sqrt{9-x}}$$

$$\frac{-5x^2 + 36x}{2\sqrt{9-x}}$$

$$\boxed{\frac{x(-5x+36)}{2\sqrt{9-x}}}$$

$$y = \frac{x}{\sqrt{x^{10}-10}} = \frac{x}{(x^{10}-10)^{1/2}}$$

Quotient Rule

$$y' = \frac{(x^{10}-10)^{1/2}(1) - (x)\left(\frac{1}{2}(x^{10}-10)^{-1/2}(10x^9)\right)}{x^{10}-10}$$

$$y' = \frac{\sqrt{x^{10}-10} - 5x^{10}(x^{10}-10)^{-1/2}}{x^{10}-10}$$

$$\frac{\sqrt{x^{10}-10} - \frac{5x^{10}}{\sqrt{x^{10}-10}}}{x^{10}-10} = \frac{\sqrt{x^{10}-10}}{\sqrt{x^{10}-10}}$$

$$\frac{x^{10}-10-5x^{10}}{(x^{10}-10)^{3/2}}$$

$$x \cdot \sqrt{x} = x \cdot x^{1/2}$$

$$x^{1+1/2} = x^{3/2}$$

$$\boxed{\frac{-4x^{10}-10}{(x^{10}-10)^{3/2}}}$$

$$y = \frac{x}{\sqrt{x^{10} - 10}}$$

Product Rule

$$y = x (x^{10} - 10)^{-1/2}$$

$$y' = x \left(-\frac{1}{2} (x^{10} - 10)^{-3/2} (10x^9) \right) + (x^{10} - 10)^{-1/2} (1)$$

$$-5x^{10} (x^{10} - 10)^{-3/2} + (x^{10} - 10)^{-1/2}$$

$$\frac{-5x^{10}}{(x^{10} - 10)^{3/2}} + (x^{10} - 10)^{-1/2} \cdot \frac{(x^{10} - 10)^{3/2}}{(x^{10} - 10)^{3/2}}$$

$$\frac{-5x^{10} + x^{10} - 10}{(x^{10} - 10)^{3/2}}$$

$$\boxed{\frac{-4x^{10} - 10}{(x^{10} - 10)^{3/2}}}$$

Homework

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