

Product Rule: If $y = f(x) \cdot g(x)$ then $y' = f(x) \cdot g'(x) + g(x) \cdot f'(x)$.

The derivative of the product of two functions is the first times the derivative of the second + the second times the derivative of the first.

a) If $y = (4x^4 + 7x^2) \left(\frac{1}{x} - 2x^3 \right)$ find y' .

$$y' = [4x^4 + 7x^2] \left[-\frac{1}{x^2} - 6x^2 \right] + \left[\frac{1}{x} - 2x^3 \right] [16x^3 + 14x]$$

b) If $u = 3\sqrt{t} e^t + t^3 \ln t$ find $u'(t)$ and $u'(1)$.

$$u'(t) = (3\sqrt{t}) e^t + e^t \left(3 \frac{1}{2\sqrt{t}} \right) + t^3 \cdot \frac{1}{t} + (\ln t) 3t^2$$