

Chain Rule: If  $y = f[g(x)]$  then  $y' = f'[g(x)]g'(x)$ .



The derivative of a composite function is the derivative of the outside function evaluated at the inside function time the derivative of the inside function. You differentiate from the outside in. 5

a) If  $w = (2x^2 - x)^5$  find  $\frac{dw}{dx}$ .

$$w' = 5(2x^2 - x)^4 \cdot (4x - 1)$$

b) If  $u(t) = \ln(x^4 + 5)$  find  $u'(t)$ .

$$u' = \frac{1}{x^4 + 5} \cdot 4x^3$$

c) If  $y = x^4 e^{3x+1}$  find  $y'$ .

$$\begin{aligned} y' &= x^4 \cdot e^{3x+1} \cdot 3 + e^{3x+1} \cdot 4x^3 \\ &= x^3 \cdot e^{3x+1} [3x + 4]. \end{aligned}$$