

# HOMEWORK: CHAIN RULE

Calculate  $\frac{dy}{dx}$ .

228.  $y = (3x^2 + 3x - 1)^4$

Sol:  $\begin{cases} f(u) = u^4, & f'(u) = 4u^3 \\ u(x) = 3x^2 + 3x - 1 & u'(x) = 6x + 3 \end{cases}$

$$\therefore \frac{dy}{dx} = \frac{d}{dx}[f(u(x))] = f'(u(x)) \cdot u'(x) = 4(3x^2 + 3x - 1)^3 (6x + 3) \quad \square$$

232.  $y = \frac{1}{\sin^2(x)}$

Sol:  $\begin{cases} f(u) = \frac{1}{u^2} = u^{-2}, & f'(u) = -2u^{-3} \\ u(x) = \sin(x), & u'(x) = \cos(x) \end{cases}$

$$\therefore \frac{dy}{dx} = \frac{d}{dx}[f(u(x))] = f'(u(x)) \cdot u'(x) = -2(\sin(x))^{-3} \cdot \cos(x) = \frac{-2\cos(x)}{\sin^3(x)} \quad \square$$

234.  $y = x^2 \cos^4(x)$

Sol:  $\frac{dy}{dx} = \frac{d}{dx}[x^2 \cos^4(x)] = \frac{d}{dx}[x^2] \cos^4(x) + x^2 \frac{d}{dx}[\cos^4(x)]$

$$= 2x \cos^4(x) + x^2 \cdot 4 \cos^3(x) (-\sin(x))$$

$$= 2x \cos^4(x) - 4x^2 \cos^3(x) \sin(x)$$

$$= 2x \cos^3(x) (\cos(x) - 2x \sin(x)) \quad \square$$

Chain Rule!

$$\begin{cases} f(u) = u^4 & f'(u) = 4u^3 \\ u(x) = \cos(x) & u'(x) = -\sin(x) \end{cases}$$