

Quiz 4 (L. 9-12)

Solutions

Problem 1 Find $f'(1)$

$$f(x) = \underbrace{e^{2x}}_{h(x)} \underbrace{(2x-1)^3}_{g(x)}$$

$$h(x) = e^{2x}$$

$$h'(x) = 2e^{2x}$$

(chain rule)

$$g(x) = (2x-1)^3$$

$$g'(x) = 3(2x-1)^2(2) \quad (\text{chain rule})$$

$$f'(x) = h'(x)g(x) + h(x)g'(x) \quad (\text{Product rule})$$

$$= 2e^{2x}(2x-1)^3 + e^{2x}6(2x-1)^2$$

$$f'(1) = 2e^{2(1)}(2(1)-1)^3 + e^{2(1)}6(2(1)-1)^2$$

$$= \boxed{8e^2}$$

Problem 2 Find $f'(0)$; $f(x) = \frac{\sin(2x)}{(1+3x)^2}$

$$g(x) = \sin(2x)$$

$$g'(x) = \cos(2x)(2)$$

$$h(x) = (1+3x)^2$$

$$h'(x) = 2(1+3x)(3)$$

(Chain rule)

$$f'(x) = \frac{g'h - gh'}{g^2} \quad (\text{Quotient Rule})$$

$$f'(x) = \frac{2\cos(2x)(1+3x)^2 - \sin(2x)(6(1+3x))}{(1+3x)^4}$$

$$f'(0) = \frac{2 \overset{=1}{\cos(0)}(1) - \overset{=0}{\sin(0)}(6)}{(1+3(0))^4} = \frac{2}{1} = \boxed{2}$$