

Correct Homework Sheet

$$\textcircled{1} \text{ a) } f(x) = 3x^{-2} + 3x^3 + 1$$

$$f'(x) = -6x^{-3} + 9x^2$$

$$\text{b) } y = \frac{4x+1}{6-2x^5}$$

$$y' = \frac{4(6-2x^5) - (-10x^4)(4x+1)}{(6-2x^5)^2}$$

$$\text{c) } f(x) = 3(2x^5 + x - 5)^{10}$$

$$f'(x) = 30(2x^5 + x - 5)^9 (10x^4 + 1)$$

$$\text{d) } h(x) = (x^2 - x)\sqrt{4 - 9x} = (x^2 - x)(4 - 9x)^{\frac{1}{2}}$$

$$h'(x) = (2x - 1)(4 - 9x)^{\frac{1}{2}} + (x^2 - x)\left(\frac{1}{2}\right)(4 - 9x)^{-\frac{1}{2}}(-9)$$

$$\textcircled{2} \text{ a) } y = \frac{2}{x} + \frac{3}{5x^3} - 6\sqrt{x} + \sqrt[3]{9x^8} - 8\pi$$

$$y = 2x^{-1} + \frac{3}{5}x^{-3} - 6x^{\frac{1}{2}} + (9x^8)^{\frac{1}{3}} - 8\pi$$

$$y' = -2x^{-2} - \frac{9}{5}x^{-4} - 3x^{-\frac{1}{2}} + \frac{1}{3}(9x^8)^{-\frac{2}{3}}(72x^7) - 0$$

$$\text{b) } y = \sqrt[3]{\frac{1-x^6}{2+(5x-1)^4}} = \left(\frac{1-x^6}{2+(5x-1)^4}\right)^{\frac{1}{3}}$$

$$y' = \frac{1}{3}\left(\frac{1-x^6}{2+(5x-1)^4}\right)^{-\frac{2}{3}} \left[\frac{-6x^5(2+(5x-1)^4) - (1-x^6)(4)(5x-1)^3(5)}{[2+(5x-1)^4]^2} \right]$$

$$\text{c) } g(x) = (x-5)^3(1x^5+2x)^9(4-2x)^5$$

$$g'(x) = 3(x-5)^2(1)(x^5+2x)^9(4-2x)^5 + 9(x^5+2x)^8(5x^4+2)(x-5)^3(4-2x)^5 + 5(x-5)^3(4-2x)^4(-2)(x^5+2x)^9$$

$$\textcircled{3} \text{ d) } f(x) = \sqrt{25+4(2x-1)^4} = (25+4(2x-1)^4)^{\frac{1}{2}}$$

$$f'(x) = \frac{1}{2}(25+4(2x-1)^4)^{-\frac{1}{2}}(16(2x-1)^3(2))$$

$$\textcircled{3} \text{ a) } y = \sqrt{x^2 - 5x\sqrt{2x^3+3}\sqrt{x}} = [x^2 - 5x(2x^3+3x^{\frac{1}{2}})^{\frac{1}{2}}]^{\frac{1}{2}}$$

$$y' = \frac{1}{2}[x^2 - 5x(2x^3+3x^{\frac{1}{2}})^{\frac{1}{2}}]^{-\frac{1}{2}}(2x - [5(2x^3+3x^{\frac{1}{2}})^{\frac{1}{2}} + 5x\left(\frac{1}{2}\right)(2x^3+3x^{\frac{1}{2}})^{-\frac{1}{2}}(6x^2+3x^{\frac{1}{2}})])$$

$$\textcircled{3} \text{ b) } f(x) = \frac{8x^3(12x^2-5x)^8}{2-3(1-32x^{10})^{1/5}}$$

$$f'(x) = \frac{\underbrace{[24x^2(12x^2-5x)^8 + 8x^3(8)(12x^2-5x)^7(24x-5)]}_{f'(x)} \cdot \underbrace{[2-3(1-32x^{10})^{1/5}]}_{g(x)} - \underbrace{[8x^3(12x^2-5x)^8]}_{f(x)} \cdot \underbrace{\left[-\frac{3}{5}(1-32x^{10})^{-4/5}(-320x^9)\right]}_{g'(x)}}{\left[2-3(1-32x^{10})^{1/5}\right]^2}$$

$$\textcircled{3} \text{ c) } f(x) = \frac{[x^5 - x\sqrt{4-x^2}]^6}{12x(5x^3-8)^7} = \frac{[x^5 - x(4-x^2)^{1/2}]^6}{12x^{1/2}(5x^3-8)^7} \quad \begin{matrix} f(x) \\ g(x) \end{matrix}$$

$$f'(x) = \frac{\overbrace{6[x^5 - x(4-x^2)^{1/2}]^5}^{f'(x)} \cdot \overbrace{[5x^4 - (1(4-x^2)^{1/2} + x(\frac{1}{2})(4-x^2)^{-1/2})(-2x)]}^{g'(x)} \cdot \overbrace{[12x^{1/2}(5x^3-8)^7]}^{g(x)} - \overbrace{[x^5 - x(4-x^2)^{1/2}]^6}^{f(x)} \cdot \overbrace{[6x^{-1/2}(5x^3-8)^7 + 12x^{1/2}(7)(5x^3-8)^6(15x^2)]}^{g'(x)}}{[12x^{1/2}(5x^3-8)^7]^2}$$

$$\textcircled{3} \text{ c) } f(x) = \frac{[x^5 - x\sqrt{4-x^2}]^6}{12\sqrt{x}(5x^3-8)^7}$$

$$f'(x) = \frac{\overbrace{6[x^5 - x\sqrt{4-x^2}]^5}^{f'(x)} \left[5x^4 - (1\sqrt{4-x^2} + x(\frac{1}{2})(4-x^2)^{-1/2})(-2x) \right] \overbrace{[12\sqrt{x}(5x^3-8)^7]}^{g(x)} - [x^5 - x\sqrt{4-x^2}]^6 \underbrace{\left[6x^{-1/2}(5x^3-8)^7 + 12\sqrt{x}(7)(5x^3-8)^6(15x^2) \right]}_{g'(x)}}{[12\sqrt{x}(5x^3-8)^7]^2}$$

$$\underbrace{\hspace{15em}}_{[g(x)]^2}$$

To be handed in today

$$f(x) = \sqrt[7]{\frac{9+16x^4}{[4x^5(3x^8+8x-2)]^5}} = \left[\frac{9+16x^4}{[4x^5(3x^8+8x-2)]^5} \right]^{1/7}$$

$$= \frac{1}{7} \left[\frac{9+16x^4}{[4x^5(3x^8+8x-2)]^5} \right]^{-6/7} \left[\frac{64x^4(4x^5(3x^8+8x-2))^{-5} - (9+16x^4)(5)(4x^5(3x^8+8x-2))^4 \left[(20x^4)(3x^8+8x-2) + 4x^5(24x^7+8) \right]}{[4x^5(3x^8+8x-2)]^{10}} \right]$$

$$f(x) = (x^2 + 5x + 7)^4$$

$$f'(x) = 4(x^2 + 5x + 7)^3(2x + 5)$$

$$f(x) = (x)^4$$

$$f'(x) = 4(x)^3(1) \\ = 4x^3$$

$$f(x) = 5(x^2 + 5x + 7)^4$$

$$f'(x) = 20(x^2 + 5x + 7)^3(2x + 5)$$

$$f(x) = 5x(x^2 + 5x + 7)^4$$

$$f'(x) = 5(x^2 + 5x + 7)^4 + 5x(4)(x^2 + 5x + 7)^3(2x + 5)$$

Quotient:
$$\frac{f'(x)g(x) - f(x)g'(x)}{[g(x)]^2}$$

Product:
$$f'(x)g(x) + f(x)g'(x)$$

Chain:
$$f'(g(x)) \cdot g'(x)$$

Attachments

Derivatives Worksheet.doc