

Differentiation Exam Review

$$\textcircled{1} \text{ a) } f(x) = 3x^5 - 4x^{-7} + \frac{8}{3} + e^3 = 3x^5 - 4x^{-7} + \frac{8x^{-1}}{3} + e^3$$

$$f'(x) = 15x^4 + 28x^{-8} - \frac{8x^{-2}}{3}$$

$$\text{b) } y = (1 - 8\sqrt{x})^8 = (1 - 8x^{1/2})^8$$

$$y' = 8(1 - 8\sqrt{x})^7 (-4x^{-1/2})$$

$$\text{c) } h(x) = (2x-3)\sqrt{9-25x^2} = \frac{(2x-3)(9-25x^2)^{1/2}}{1}$$

$$h'(x) = (2x-3)\left(\frac{1}{2}\right)(9-25x^2)^{-1/2}(-50x) + 2(9-25x^2)^{1/2}$$

$$\text{d) } f(x) = \frac{3-x^5}{7x^2-x+5}$$

$$f'(x) = \frac{(7x^2-x+5)(-5x^4) - (3-x^5)(14x-1)}{(7x^2-x+5)^2}$$

$$\textcircled{2} \text{ a) } y = \sqrt[5]{3x^6 - 5(3x+7)^4} = (3x^6 - 5(3x+7)^4)^{1/5}$$

$$y' = \frac{1}{5} (3x^6 - 5(3x+7)^4)^{-4/5} [18x^5 - 20(3x+7)^3(3)]$$

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

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

Differentiation Rules Exam Review

$$\textcircled{a} \text{ c) } y = \frac{3}{4} \sqrt[3]{x^8} - \frac{2}{x} + \sqrt[5]{10x^7} + \frac{2}{3x^{-5}} - \pi^4$$

$$y = \frac{3}{4} x^{8/3} - 2x^{-1} + (10x^7)^{1/5} + \frac{2}{3} x^5 - \pi^4$$

$$y' = 2x^{5/3} + 2x^{-2} + \frac{1}{5} (10x^7)^{-4/5} (70x^6) + \frac{10}{3} x^4$$

$$\textcircled{d) } f(x) = \frac{3x\sqrt{x^4-1}}{(2x-5)^4} = \frac{3x(x^4-1)^{1/2}}{(2x-5)^4}$$

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

$$\textcircled{3} \text{ a) } y = \sqrt{2x^2 + \sqrt{x^7 - 8x\sqrt{3-x^3}}} = \left[2x^2 + (x^7 - 8x(3-x^3)^{1/2})^{1/2} \right]^{1/2}$$

$$y' = \frac{1}{2} \left[2x^2 + \sqrt{x^7 - 8x\sqrt{3-x^3}} \right]^{-1/2} \left[4x + \frac{1}{2} \left[x^7 - 8x(3-x^3)^{1/2} \right]^{-1/2} \left[7x^6 - \left[8x \left(\frac{1}{2} \right) (3-x^3)^{-1/2} (-3x^2) + 8(3-x^3)^{1/2} \right] \right]$$

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

$$f'(x) = \frac{1}{2} \left[\frac{4(3x^3-2)^{1/2} - 5x}{7x^5(2x^3-x^2+3)^{1/2}} \right]^{-1/2} \left[\frac{\left[7x^5(2x^3-x^2+3)^{1/2} \right] \left[2(3x^3-2)^{-1/2} (9x^2) - 5 \right] - \left[4(3x^3-2)^{1/2} - 5x \right] \left[7x^5 \left(\frac{1}{2} \right) (2x^3-x^2+3)^{-1/2} (6x^2-2x) + 25x^4(2x^3-x^2+3)^{1/2} \right]}{\left[7x^5(2x^3-x^2+3)^{1/2} \right]^2}$$