

Name Answers

Questions 1-3: Find the derivative of each function. Do NOT simplify answers.

1) $f(x) = 2(x^4 - 8x + 10)^7$

$$f'(x) = 14(x^4 - 8x + 10)^6 (4x^3 - 8)$$

2) $f(x) = \frac{(5-x)^{11}}{(4x^2 + 5x)^4}$

$$f'(x) = \frac{11(5-x)^{10}(-1)(4x^2+5x)^4 - (5-x)^{11} \cdot 4(4x^2+5x)^3(8x+5)}{\left((4x^2+5x)^4\right)^2}$$

3) $f(x) = (9x+4)^5(x^3+5x^2-1)^6$

$$f'(x) = 5(9x+4)^4(9)(x^3+5x^2-1)^6 + (9x+4)^5 \cdot 6(x^3+5x^2-1)^5(3x^2+10x)$$

Questions 4-7: Find the derivative of each function. Simplify each answer.
(Write all final answers with positive exponents.)

$$4) f(x) = 6\sqrt[3]{x^2} = 6x^{2/3}$$

$$f'(x) = 4x^{-1/3}$$

$$f'(x) = \frac{4}{x^{1/3}}$$

$$6) f(x) = \left(\frac{-1}{x^2}\right)^5$$

$$f(x) = -\frac{1}{x^{10}} = -x^{-10}$$

$$f'(x) = 10x^{-11}$$

$$f'(x) = \frac{10}{x^{11}}$$

$$5) f(x) = \frac{3}{(x^2+2)^4}$$

$$f'(x) = \frac{0 - 3 \cdot 4(x^2+2)^3(2x)}{((x^2+2)^4)^2}$$

$$f'(x) = \frac{-24x(x^2+2)^3}{(x^2+2)^8}$$

$$f'(x) = \frac{-24x}{(x^2+2)^5}$$

$$7) f(x) = \frac{4}{\sqrt{3x}} = 4(3x)^{-1/2}$$

$$f'(x) = -2(3x)^{-3/2}(3)$$

$$f'(x) = \frac{-6}{(3x)^{3/2}}$$

The following are multiple choice. The derivative is given. Simplify each derivative below. You must show work to get full credit.

$$8) f'(x) = 5 \left(\frac{x^2 - 3}{5x^2 - 9} \right)^4 \left(\frac{2x(5x^2 - 9) - (x^2 - 3)(10x)}{(5x^2 - 9)^2} \right)$$

$$a) f'(x) = \frac{10x(x^2 - 3)^4(10x^2 - 17)}{(5x^2 - 9)^6}$$

$$= \frac{5(x^2 - 3)^4 (10x^3 - 18x - 10x^3 + 30x)}{(5x^2 - 9)^4 (5x^2 - 9)^2} \quad b) f'(x) = \frac{-10x(x^2 - 3)^4(5x^2 - 16)}{(5x^2 - 9)^5}$$

$$c) f'(x) = \frac{-240x(x^2 - 3)^4}{(5x^2 - 9)^6}$$

$$= \frac{5(x^2 - 3)^4 (12x)}{(5x^2 - 9)^6}$$

$$d) f'(x) = \frac{60x(x^2 - 3)^4}{(5x^2 - 9)^6}$$

$$e) f'(x) = \frac{100x(x^2 - 3)^4}{(5x^2 - 9)^6}$$

$$= \frac{60x(x^2 - 3)^4}{(5x^2 - 9)^6}$$

$$q) \quad g'(x) = 3(1-x)^2(-1)(4x+1) + (1-x)^3(4)$$

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

$$= (1-x)^2(-12x-3+4-4x)$$

$$= (1-x)^2(-16x+1)$$

$$a) \quad g'(x) = -12(1-x)^2$$

$$b) \quad g'(x) = (1-x)^2(1+8x)$$

$$c) \quad g'(x) = (1-x)^2(1-16x)$$

$$d) \quad g'(x) = 3(1-x)^2(4x+1)$$

$$e) \quad g'(x) = (1-x)^2(16x+7)$$

----- EXTRA CREDIT -----

Find the equation of the tangent line to $y = -\frac{1}{9}(x^2 - 4x)^3$ at $x = 3$

find slope at $x=3$

$$y' = -\frac{1}{3}(x^2 - 4x)^2(2x - 4)$$

$$y' = -\frac{1}{3}(-3)^2(2)$$

$$y' = -6 = \text{slope}$$

point: when $x=3$

$$y = -\frac{1}{9}(3^2 - 4(3))^3$$

$$y = \frac{27}{9} = 3$$

$$(3, 3)$$

$$y - 3 = -6(x - 3) \quad \text{or} \quad y = -6x + 21$$