

Name: KEY

Read all directions and problems carefully! Show all appropriate work for credit.

1. Find the derivative of each function defined as follows.

$$y = \frac{6}{x^2} - 3x^{12} - 8\sqrt{x} + x^{-\frac{2}{5}} = 6x^{-2} - 3x^{12} - 8x^{\frac{1}{2}} + x^{-\frac{2}{5}} \quad y = \frac{x^7 + 5x^5 - x^4}{x^3} = x^4 + 5x^2 - x$$

$$\frac{dy}{dx} = 6(-2x^{-3}) - 3(12x^{11}) - 8(\frac{1}{2}x^{-\frac{1}{2}}) + (-\frac{2}{5}x^{-\frac{7}{5}})$$

$$= -12x^{-3} - 36x^{11} - 4x^{-\frac{1}{2}} - \frac{2}{5}x^{-\frac{7}{5}}$$

+3

$$\frac{dy}{dx} = 4x^3 + 10x - 1$$

+3

2. For the function $f(x) = 2x^3 - 3x^2 - 120x + 92$, find all values of x where the tangent line is horizontal.

$$f'(x) = 6x^2 - 6x - 120 = 0$$

$$6(x^2 - x - 20) = 0$$

$$6(x-5)(x+4) = 0$$

$$x=5; x=-4$$

+2

3. Find the derivative of the following functions using the Product/Quotient Rules.

$$f(x) = (x^{-2} - 2)(x^3 - 4x^{-1})$$

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

$$= -2 + 8x^{-4} + 3 + 4x^{-4} - 6x^2 - 8x^{-2}$$

$$= -6x^2 - 8x^{-2} + 12x^{-4} + 1$$

+3

$$f(x) = \frac{2\sqrt[3]{x}}{x^5 - 3x^3} = \frac{2x^{\frac{1}{3}}}{x^5 - 3x^3}$$

$$f'(x) = \frac{2(\frac{1}{3}x^{-\frac{2}{3}})(x^5 - 3x^3) - 2x^{\frac{1}{3}}(5x^4 - 9x^2)}{(x^5 - 3x^3)^2}$$

$$= \frac{\frac{2}{3}x^{\frac{13}{3}} - 2x^{\frac{7}{3}} - 10x^{\frac{13}{3}} + 18x^{\frac{7}{3}}}{(x^5 - 3x^3)^2}$$

$$= \frac{-\frac{28}{3}x^{\frac{13}{3}} + 16x^{\frac{7}{3}}}{(x^5 - 3x^3)^2}$$

+4

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