

Name _____ KEY _____

Section 0242

Answer all problems. There are 10 possible points.

1. (6pts) Find the derivative of the following functions (Show all work to receive full credit!):

a) $f(x) = \frac{1}{\sqrt[3]{x}}$

$$f'(x) = \frac{-1}{3} x^{\left(\frac{-1}{3}-1\right)} = -\frac{1}{3} x^{\left(\frac{-1-3}{3}\right)} = -\frac{1}{3} x^{-\frac{4}{3}}.$$

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

$$g(x) = \frac{2x^2}{x^3} - \frac{x}{x^3} + \frac{1}{x^3} = 2x^{-1} - x^{-2} + x^{-3}.$$

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

2. (4pts) Find all the values of x where the tangent line of the function

$$f(x) = x^3 + 6x^2 + 9x - 6 \text{ is horizontal (Show all work to receive full credit!):}$$

The tangent line is horizontal if $f'(x) = 0$.

$$\text{Therefore, } 0 = f'(x) = 3x^2 + 12x + 9 = 3(x^2 + 4x + 3) = 3(x+1)(x+3).$$

Then $x = -1, -3$.