Math 115- Lines Tangent to Curves

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Problem 1) Find the equation to the following functions:

(a) $f(x) = 3x^2 + 4x + 1$ at $(1, 8)$, with the rate of change function $f'(x) = 6x + 4$.

(b) $f(x) = 5x^2 + 2x + 3$ at $(2, 27)$ with the rate of change function $f'(x) = 10x + 2$.

(c) $f(x) = 7x^3 + 2x^2 + x + 1$ at $(1, 11)$ with the rate of change function $f'(x) = 21x^2 + 4x + 1$.

(d) $f(x) = x^2 + \dfrac{1}{x} + \dfrac{1}{x^2}$ at $(1, 3)$ with the rate of change function $f'(x) = 2x - \dfrac{1}{x^2} - 2 \cdot \dfrac{1}{x^3}$.

Problem 2) By now, you have seen the rate of change functions for several functions such as quadratic, cubic, and basic rational equations. For this problem, you are to deduce the rate of change functions for some new functions. The skill you are working to develop here is pattern recognition.

(a) Look back at the rate of change functions in 1(a) and 1(b). Comment on any patterns you see. Determine the rate of change function for $f(x) = 4x^2 + 7x + 5$.

(b) Determine the rate of change function for an arbitrary quadratic equation of the form $f(x) = ax^2 + bx + c$.

(c) Now look back at your rate of change answer in 1(c) and 2(b). Can you determine the rate of change function for the cubic function $f(x) = 2x^3 + 3x^2 + 4x + 5$?

(d) Determine the rate of change function for an arbitrary cubic function, which is of the form"

$$f(x) = ax^3 + bx^2 + cx + d$$