Lesson 2.1 – Derivatives of Quadratic Functions

1. (a) Carefully sketch the graph of \( f(x) = (x - 3)^2 \) in the interval \([0, 4]\) on the \( x \)-axis, and in the interval \([0, 9]\) on the \( y \)-axis. Then sketch the tangent line to the graph of \( f \) at \( x = 1 \).

(b) Estimate the slope of the tangent line using “rise-over-run.”

(c) Set up a table like Example 2.1.1. Use it to estimate the slope of the tangent line at \( x = 1 \).

(d) Expand \((x - 3)^2\) by multiplying \((x - 3)(x - 3)\).

(e) Use the formula for the derivative of a quadratic to find a formula for \( f'(x) \).

(f) Use the formula from part (f) to find \( f'(1) \). Were your estimates good ones?