

SECTION 4.9 NEWTON'S METHOD

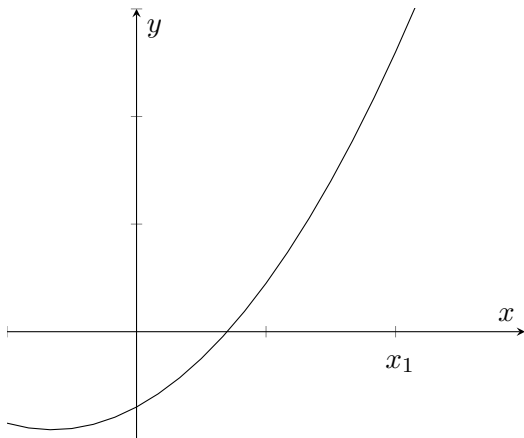
1. Why would you want to solve $f(x) = 0$?

2. You are going to produce the *iterative* formula that is Newton's Method.

(a) Find the equation of the line tangent to $f(x)$ at $x = x_1$. (Assume $f'(x_1) \neq 0$.)

(b) Determine the x -value where the tangent line from part (a) intersects the x -axis. Call this x -value x_2 .

(c) Draw a picture of your calculations on the graph below.



(d) Given a guess x_n , write the formula for how to get a better guess, x_{n+1} .

3. MODEL PROBLEM: Let $f(x) = x^3 - 5x$.

(a) Factor $f(x)$, find its roots algebraically, and sketch its graph.

(b) Assume you couldn't factor the function and you wanted to find its positive root. What would be a reasonable first guess and why?

(c) Using a first guess of $x_1 = 3$, calculate 3 iterations of Newton's method. You must hold onto as many digits as your calculating device will allow. No rounding.

(d) How close is your estimate of the root, x_3 , to the actual root?