Optimization problems *(section 4.5)* and other methods of calculus require finding roots, x-intercepts, solutions. Algebra does this, but it cannot solve every equation. *Newton's method* lets us find the approximate roots of many equations.

NEWTON'S METHOD

Newton's method, **Newton-Raphson method** *(method)* – an iterative method for solving roots of equations by successively approximating the value of x.

NOTE: Newton's method works best on a computer or a programmable calculator.

WHAT NEWTON'S METHOD DOES

Newton's method gets closer and closer (*converges*) to the actual root of a function by following tangent lines from the function to the x-intercept line again and again. See Figure 1.

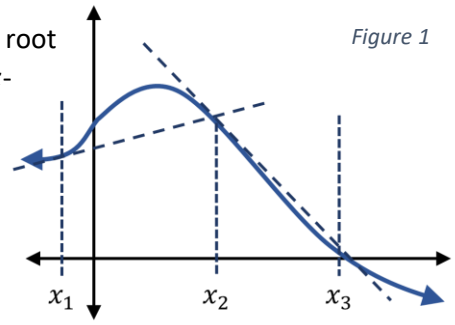

Figure 1

HOW TO USE NEWTON'S METHOD

To approximate the roots of a function f,

1. Start with $n = 1$ and x_n being some number in f's domain.
2. Take the derivative at x_n, which is $f'(x_n)$.
3. Take the value of f at x_n, which is $f(x_n)$.
4. The next x-number, $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$.
5. Repeat steps 2-4 until enough precision of x_n is achieved.

WARNING: Newton's method is not guaranteed to converge to a value of x_n.

HOW WOULD YOU ANSWER?

- What is Newton's method? How does it work?
- Why is Newton's method not guaranteed to approximate a function's root? Where might this happen?