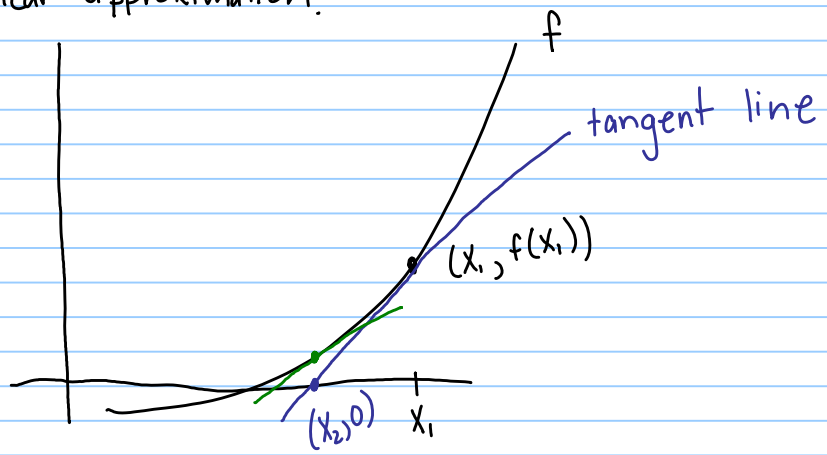
4.7 Newton's Method

Note Title 12/11/2014

Use Newton's Method to find the zeros of a function using linear approximation.



1. Pick x_1 (somewhere close to the zero)
2. Find the equation of the tangent line
   The x-intercept of the tangent line is a better approximation for the zero of $f(x)$
3. Repeat using $(x_2, f(x_2))$

$$y - y_1 = m(x - x_1)$$

$$y - f(x_1) = f'(x_1)(x - x_1) \qquad m = f'(x_1)$$

at $(x_2, 0)$

$$0 - f(x_1) = f'(x_1)(x_2 - x_1)$$

$$-f(x_1) = f'(x_1)(x_2 - x_1)$$

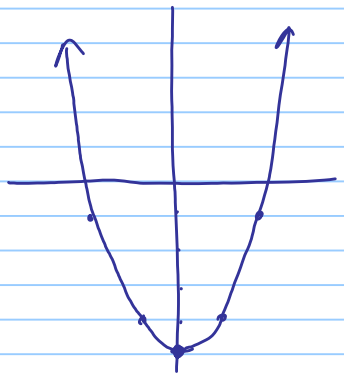
$$\frac{-f(x_1)}{f'(x_1)} = x_2 - x_1$$

$$x_1 - \frac{f(x_1)}{f'(x_1)} = x_2$$

$$x_3 = x_2 - \frac{f(x_2)}{f'(x_2)}$$

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

#1 Find the zeros of $f(x) = x^2 - 5$



initial guess $x = 2$

$f(x) = x \wedge 2 - 5$

$f'(x) = 2x$

$= 2 * x$

Pg 231 #1, 3, 5