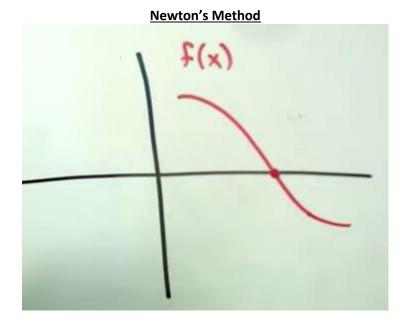**Math 151**
4.8: Newton's Method

Video 1: "Newton's Method" with URL https://youtu.be/1uN8cBGVpfs

<u>Concept</u>: (start 0:00 and end 2:10) Newton's Method

Newton's Method

$f(x)$

Start with a given guess: x_1

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

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

$$x_4 = x_3 - \frac{f(x_3)}{f'(x_3)}$$

$$\vdots$$

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

Example 1: (start 2:10 and end 7:29) Find where $f(x) = x^7 - 1000$ intersects the x-axis; find the solution correct to 8 decimal places.

Video 2: "Newton's Method - More Examples Part 1 of 3" with URL https://youtu.be/xdLgTDlFwrc

<u>Example 2</u>: (start 0:00 and end 6:53) Compute two iterations of Newton's Method for the function $f(x) = x^2 - 8$ for the initial guess $x_1 = 3$.

Video 3: "Newton's Method - More Examples Part 2 of 3" with URL https://youtu.be/wFubpuCNB_w

<u>Example 3</u>: (start 0:00 and end 5:13) Apply two iterations of Newton's Method to approximate the *x*-value of a point of intersection of the two functions $f(x) = x^2 - 4$ and $g(x) = 2x - 3$ for the initial guess $x_1 = 0$. That is, what is the value of x_3 ?

Video 4: "Newton's Method - *How it Can FAIL* - More Examples Part 3 of 3" at the URL

https://youtu.be/9RjI_so9oSM

<u>Example 4</u>: (start 0:00 and end 3:47) Given the equation $f(x) = (x-2)^2 - 1$ and initial guess $x_1 = 2$, why would Newton's Method fail to approximate a solution?