Today:

A spreadsheet demonstration for Newton's Method.

Basically, all you have to know is how to take a derivative and do arithmetic with a spreadsheet:

Formulas start with "=" sign. (without the quotes)

Instead of "x" we will be referring to cells in the spreadsheet.

"Relative References" allow you to create recursions of great complexity with very little work or thought.

As time permits, we'll work exercises from 3.6 - 3.9.

From the spreadsheet in the Notes:

https://harryzaims.com/201/201-fall-19/notes/chapter-03/191028-3-8-spreadsheet-examples.xlsx

#3. $f(x) = 2x^3 - 3x^2 + 2,\ x_1 = -1$

$f'(x) = 6x^2 - 6x$

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

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

I'll put a copy of the spreadsheet in next to today's notes. It will count as 2 full homework assignments, replacing your two worst.

6. **SCalc8 3.7.023.MI.** (3354020)

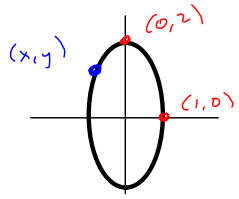
Find the points on the ellipse $4x^2 + y^2 = 4$ that are farthest away from the point (1, 0).

$(x, y) = \left(\quad , \; -\frac{1}{3}, -\frac{4\sqrt{2}}{3} \right)$ (smaller y-value)

$(x, y) = \left(\quad , \; -\frac{1}{3}, \frac{4\sqrt{2}}{3} \right)$ (larger y-value)

Distance from (1,0) to (x,y):

$\sqrt{(x-1)^2 + y^2} = d$



$4x^2 + y^2 = 4$

$x^2 + \frac{y^2}{4} = 1$

$y^2 = 4 - 4x^2$

$y = \pm\sqrt{4-4x^2}$

$= \pm 2\sqrt{1-x^2}$

$= \sqrt{(x-1)^2 + \left(\pm 2\sqrt{1-x^2}\right)^2}$

$= \sqrt{(x-1)^2 + 4(1-x^2)}$

$= \sqrt{x^2 - 2x + 1 + 4 - 4x^2} = \sqrt{-3x^2 - 2x + 5}$

$\Rightarrow d^2 = -3x^2 - 2x + 5$ To maximize $\sqrt{\text{something}}$, just maximize something.

So $f(x) = d^2 = -3x^2 - 2x + 5$

$\Rightarrow f'(x) = -6x - 2 \overset{\text{SET}}{=} 0 \Rightarrow$

$-6x = 2$

$x = -\frac{1}{3} \Rightarrow y = \pm\sqrt{4-4x^2} = \pm\sqrt{4 - 4\left(\frac{1}{9}\right)}$

$= \pm\sqrt{4 - \frac{4}{9}} = \pm 2\sqrt{1 - \frac{1}{9}}$

$= \pm 2\sqrt{\frac{8}{9}} = \pm\frac{2}{3}\sqrt{8}$

$= \pm\frac{2}{3} \cdot 2\sqrt{2} = \pm\frac{4}{3}\sqrt{2} = y$