Newton's Method Using the Graphing Calculator

(This technique is used for approximating the zeroes of a function)

Initial Set-up

- Press **Y =**
- Set Y_1 = original function
- Set Y_2 = the function's first derivative
- QUIT ➔ Press **2nd** **MODE**

First Iteration

In the next command, *replace your initial value wherever you see " # "*

- $\# - Y_1(\#)/\ Y_2(\#)$ Note: Y_1 is obtained by entering the following: VARS, ➔, ENTER, 1
- ENTER *(This will produce your 1st iteration on the screen)*

Subsequent Iterations

- $ANS - Y_1(ANS)/Y_2(ANS)$ Note: *ANS* is obtained by entering: **2nd** **(-)**
- ENTER *(This will produce your 2nd iteration on the screen)*
- ENTER *(This will produce your 3rd iteration on the screen)*

Continue to press the ENTER key as often as needed. Stop when the digits duplicated from one answer to the next are to the desired accuracy.

Example: Find the value of $\sqrt[6]{2}$ to nine decimal places.

This is equivalent to finding the zeroes of the function $f(x) = x^6 - 2$

(Hint: Set the left side of the equation to 0 and solve for x to see why)

- Press **Y =**
- Set $Y_1 = x^6 - 2$
- Set $Y_2 = 6x^5$
- QUIT ➔ Press **2nd** **MODE**

Note: This example arbitrarily chooses an initial value of 1.

- $1 - Y_1(1)/\,Y_2(1)$ Note: Y_1 is obtained by entering the following: VARS, ➔, ENTER, 1
- ENTER *The initial estimate is:* $\mathbf{1.1\overline{6}}$
- $ANS - Y_1(ANS)/Y_2(ANS)$ Note: *ANS* is obtained by entering: **2nd** **(-)**
- ENTER *The 2nd iteration = 1.126443678*
- ENTER *The 3rd iteration = 1.122497067*
- ENTER *The 4th iteration = 1.122462051*
- ENTER *The 5th iteration = 1.122462048*
- ENTER *The 6th iteration = 1.122462048*

Solution: The value of $\sqrt[6]{2}$ to nine decimal places = *1.122462048*