## Sec 4.6 Newton's Method

### A. The Newton's Method Formula

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

Examples:

1.) Starting with $x_0 = 2$ find the third approximation $x_3$ to the root of the equation $x^3 - 2x - 5 = 0$

| $n$ | $x_n$ | $f(x_n)$ | $f'(x_n)$ | $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$ |
|---|---|---|---|---|
| 0 | | | | |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |

2.) Starting with $x_0 = 1$ find the third approximation $x_3$ to the root of the equation $\tan^{-1}(x) = 1 - x$

| $n$ | $x_n$ | $f(x_n)$ | $f'(x_n)$ | $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$ |
|---|---|---|---|---|
| 0 | | | | |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |

**To find these approximations using the calculator:**
Let Y1 = *f(x)* and let Y2 = *f '(x)*
Then in the HOME SCREEN type in $x_0$ and press ENTER
Type in immediately after you hit ENTER: – Y1(Ans) / Y2(Ans) and press ENTER
(Each time you press enter you will get the next approximation of the root.)

3. a.) Find the equation $f(x)$ that results in a solution of $\sqrt[4]{9}$

b.) Find the second, third and fourth approximations of the root to this function if $x_0 = 2$

4.) Find the fourth approximation $x_2$ to the root of the equation $e^{-x} = 2 + x$

| $n$ | $x_n$ | $f(x_n)$ | $f'(x_n)$ | $x_{n+1} = x_n - \dfrac{f(x_n)}{f'(x_n)}$ |
|---|---|---|---|---|
| 0 | | | | |
| 1 | | | | |
| 2 | | | | |