Numerical Analysis Hw1

2) *f(x)=*$x^4 - 3 * x^2 - 3 = 0$ *in there it is converted to form by g(x) which help to calculate the fixed point function according to Corollary 2.5.*

x=$\sqrt[4]{3 * x^2 + 3}$ *and g(x)=* $\sqrt[4]{3 * x^2 + 3}$ *then*

There need a stating point (p(o)) , then we will calculate the p(1) which is equal to g(p(0));

P(1)=G(P(0))=1,56 ,P(0) is given by the question,

Theoretical number of iterations required Formula is;

$$(p(n) - p) \leq \frac{k^n}{1-k} * |p1 - p0| \text{ for all } n \geq 1 ,$$

-The n means is the number of iterations;

Then, K will be maximum value then g'(x) in [1,2], if the calculating g'(1) and g'(2) , it will g'(1)=0,3912 and g'(2)=0,3936 , therefore We select bigger then 0,3936 , so this is 0,4.

To sum up , If we write in the equation instead of iterations required Formula;

$$p(n) - p \leq \frac{0{,}4^n}{1 - 0{,}4} * |1{,}56 - 1|$$

$$10^{-4} \leq \frac{0{,}4^n}{1 - 0{,}4} * |1{,}56 - 1|$$

N value must be bigger then 4.95102 as integer so N value is 5.

3) *4. EXERCISE* *Second and False Theoretical Formula is;*

$$p(n) = p(n-1) - f\big(p(n-1)\big) * \frac{(p(n-1)-p(n-2))}{f\big(p(n-1)\big)-f\big(p(n-2)\big)}$$

$$f(x) = -x^3 - \cos(x)$$

$$p(2) = p(1) - f\big(p(1)\big) * \frac{(p(1)-p(0))}{f\big(p(1)\big)-f\big(p(0)\big)}$$

F(0)=-1;

F(-1)=1-cos(-1)

$$p(2) = -\left(-\frac{1}{-2+\cos(-1)}\right) = -0{,}685$$

$$p(3) = p(2) - f\big(p(2)\big) * \frac{(p(2)-p(1))}{f\big(p(2)\big)-f\big(p(1)\big)} = -1{,}25$$

5. EXERCISE

1) $f(x) = x^3 - 2 * x^2 - 5$ -> $f'(x) = 3x^2 - 4x$

Newton Method Formula;

$$p(n) = p(n-1) - \frac{f(pn-1)}{f'(pn-1)}$$

So for p(0)=1, it will be root at the p5=2,6905 ,it is selected the p(0) to begining of the definition

2) $f(x) = x^3 + 3 * x^2 - 1$ -> $f'(x)= 3x^2 + 6$

Newton Method Formula;

$$p(n) = p(n-1) - \frac{f(pn-1)}{f'(pn-1)}$$

So for p(0)=-3, it will be root at the p(3)=-2,8793 it is selected the p(0) to begining of the definition

3) $f(x) = x - \cos(x)$ *->* *f'(x)=* $1 + sinx$

Newton Method Formula;

$$p(n) = p(n-1) - \frac{f(pn-1)}{f'(pn-1)}$$

So for p(0)=0, it will be root at the p(4)=0,7390, it is selected the p(0) to begining of the definition

4) $f(x) = x - 0{,}8 - 0{,}2sinx$ *->* *f'(x)=* $1 - 0{,}2\cos(x)$

Newton Method Formula;

$$p(n) = p(n-1) - \frac{f(pn-1)}{f'(pn-1)}$$

So for p(0)=0, it will be root at the p(3)=0,9643, it is selected the p(0) to begining of the definition