Name : $\qquad$

TO RECEIVE FULL CREDIT YOU MUST SHOW ALL YOUR WORK (Unless otherwise stated).

1. State the order of convergence of the methods listed below when used to determine the zeros of a given nonlinear function $f(x)$.

- the Bisection method
- the Newton-Raphson method
- the Secant method

2. How many steps of the bisection method are needed to determine the root with an error of at most $\frac{1}{2} \times 10^{-12}$, if the starting interval is $[0.2,1.8]$ ?
3. Every polynomial of degree $n$ has $n$ zeros (counting multiplicity) in the complex plane.

- Does every real polynomial have $n$ real zeros?
- Does every polynomial of infinite degree $f(x)=\sum_{n=0}^{\infty} a_{n} x^{n}$ have infinitely many zeros?

4. Compute the zero of $f(x)=x^{3}-3 x+1$ on $[0,1]$ using the Bisection method. Carry out just three steps.
5. If Newton's method is used on $f(x)=x^{3}-x+1$ starting with $x_{0}=-2$, what will $x_{3}$ be?
6. If we use the secant method on $f(x)=x^{3}-2 x+2$ starting with $x_{0}=0$ and $x_{1}=1$, what is $x_{3}$ ?
