Intermediate Value Theorem

Let f be a continuous function on the interval [a,b]. Then f realizes every value between [f(a),f(b)]

Root Finding

Method Title	Requirements on f(x)	Convergence info	Notes
Bistection	- continuous on [a,b] - f(a)*f(b)<0	Global, Linear, s=1/2	#n = log_2((b-a)/Ep)-1 Ep=0.5*10^{-p}
Fixed Point Iteration x_(i+1) = g(x_i)	g(r) = r <-> f(r) =0 g(x) cont. diff.	Local, Linear, s=|g'(r)|<1	
Newton's Method x_(i+1) = x_i - ((f(x_i) (x_i-x_(i-1))/f(x_i)-f(x_(i-1)))	-twice cont. diff. -Need f'(x)	Local if f'(r)!=0: quadratic, s = f''(r)/2f'(r). else linear s= (m-1)/m.	#n - ((m-1)/m)^{n}= 0.5*10^{-p}

Error

Forward Error	Backward Error
|r-x_a|	|f(r)-f(x_a)|

Factorization

LU	PA=LU
Ax=b	Ax=b
A=LU	PAx=Pb and LUx=Pb
Lc=b	Lc=Pb
Ux=c	Ux=c

Newton's method Error

e_(i+1)~\|f''(r)/2f'(r)\|e_i

Elimination Method/Operation Count

Naive Guassian	(2/3)*n^3
Back Substitution	k*n^2
LU Factorization	(2/3)*n^3
Twice Back Substitution	2k*n^2

Error Magnification Factor

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