$|g'(x)| < 1$

$\Rightarrow m$; $m < 1$ $\quad I \equiv [r-c, r+c]$

1 $\quad e_{k+1} \leq m e_k \Rightarrow e_1 \leq m e_0$

$\Rightarrow e_k \leq m e_{k-1} = m^2 e_{k-2} = m^3 e_{k-3}$

$\Rightarrow e_k < m^k e_0$

$e_0 = |r - x_0| = |(r - x_1) + (x_1 - x_0)|$

$e_0 \leq |r - x_1| + |x_1 - x_0|$

$e_0 \leq m e_0 + |x_1 - x_0|$

$\Rightarrow e_0 (1-m) \leq |x_1 - x_0|$

2 $\quad e_0 \leq \dfrac{|x_1 - x_0|}{1-m}$

$e_k \leq m^k \dfrac{|x_1 - x_0|}{1-m}$

$\varepsilon \Rightarrow e_k < \varepsilon$

$e_k = |x_k - r|$