Method	Input	Iteration	Idea behind method	Required for convergence	Pros	Cons
Bisection	f(x), interval (a,b)	X_{n+1} = midpoint of the interval where f(a)f(b) < 0.	From a starting window (a,b), continually cut the window in half retaining that $f(a_{new})f(b_{new}) < 1$. This will make the window smaller and zoom it in on the true root.	F(x) is continuous, f(a)f(b) < 0	Always finds solution.	Linear of rate 0.5.
Fixed Point	F(x), x_0	$G(x) = g(x_{n-1})$	We find a g(r) = r from a expression f(x) = 0. Then, g(r) = r will converge on our answer using g(x) = x + c*f(x) as long as the neighborhood of the solution has derivative less than 1.	G'(x) < 1 near x*, x_0 near x.	At least linear	Can diverge for some functions.
Newton	F(x), x_0	$x_n = x_{n-1} - \frac{f(x_{n-1})}{f'(x_{n-1})}$	We use the slope around each guess to find the next point, which can be faster	F(X) is twice differentiable, x_0 near root	Quadratic once it is in neighborhood of root	Can move randomly until it gets near root.
Secant	F(x), x_0	$x_n = x_{n-1} - \frac{1}{m_{sec}} f(x_{n-1})$	Similar to Newton, but we don't need to find derivative of f(x)	Same as Newton	Rate of convergence is ~1.61, doesn't need derivative	Not as fast as Newton