

Class Prep 10 | 6.1.1

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Section 6.1.1 Bisection Method

```
bisection = function(f, a, b, tol = 1e-3, m = 100)
{
  iter = 0
  f.a = f(a)
  f.b = f(b)

  while(abs(b - a) > tol)
  {
    iter = iter + 1
    if(iter > m)
    {
      warning("iteration maximum exceeded")
      break
    }
    xmid = (a+b)/2
    ymid = f(xmid)
    if(f.a * ymid > 0)
    {
      a = xmid
      f.a = ymid
    }else{
      b = xmid
      f.b = ymid
    }
  }
  root = (a+b)/2
  return(root)
}

f = function(x) {x^2 - 1}
bisection(f, .5, 1.25, tol=1e-3)

## [1] 0.9998779

bisection(f, .5, 1.25, tol=1e-6)

## [1] 0.9999999

bisection(f, .5, 1.25, tol=1e-9)

## [1] 1
```

```
f = function(x){x^3 - x}
bisection(f, -2, 1.25, tol=1e-6)
## [1] -0.9999997
bisection(f, -.5, 1.25, tol=1e-6)
## [1] 1.788139e-07
bisection(f, -2, 1.25, tol=1e-6) # is this a typo? its the same as the first
## [1] -0.9999997
bisection(sin, 1, 7, tol=1e-6)
## [1] 3.141593
bisection(sin, -50, 100, tol=1e-6)
## [1] -9.424778
bisection(sin, -1000, 2000, tol=1e-6)
## [1] 1721.593
bisection(tan, 1, 2)
## [1] 1.570801
bisection(tan, -1, 1)
## [1] -0.0004882812
```