LAB EXPERIMENT - 2

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Secant Method

SAQ 1

```
function [xx,yy]=Secant(f,a,b,tol,kmax)
y(1)=f(a);
y(2)=f(b);
x(1)=a;
x(2)=b;
Dx(1)=0;
Dx(2)=0;
disp(' step    x(k-1)    x(k)    x(k+1)    y(k+1)     Dx(k+1')
for k=2:kmax
x(k+1)=x(k)-y(k)*(x(k)-x(k-1))/(y(k)-y(k-1));
y(k+1)=f(x(k+1));
Dx(k+1)=x(k+1)-x(k);
iter=k-1;
out=[iter,x(k-1),x(k),x(k+1),y(k+1),Dx(k+1)];
disp(out)
xx=x(k+1);
yy=y(k+1);

if abs(y(k+1))<tol
disp('secant method has converged');break;
end

if(iter>=kmax)
disp('zero not found to desired tolerance')
end
end
```

```
f = @(x) 2*x^2 + 3 * log(x) - 1;
a = 0.5;
b = 1;
[xx, yy] = Secant(f, a, b, 0.00001, 20);
```

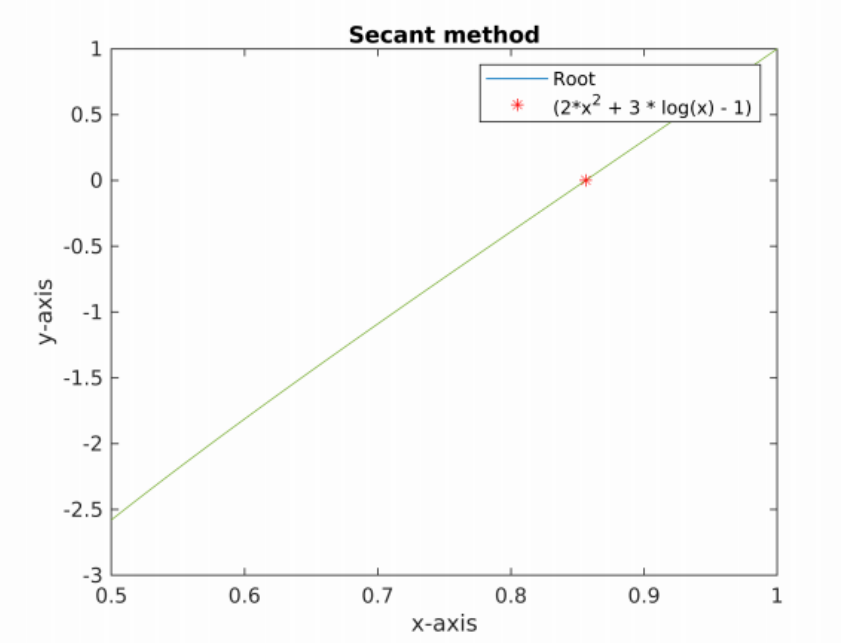
```
 step    x(k-1)     x(k)    x(k+1)     y(k+1)      Dx(k+1
    1.0000    0.5000    1.0000    0.8603    0.0289   -0.1397

    2.0000    1.0000    0.8603    0.8562    0.0001   -0.0042

    3.0000    0.8603    0.8562    0.8561   -0.0000   -0.0000

secant method has converged
```

```
disp([xx, yy]);
```

```
    0.8561   -0.0000
```

```
x = 0.5:0.01:1;
plot(x, 2*x.^2 + 3 * log(x) - 1);
hold on
plot(xx(end), yy(end), 'r*');
xlabel('x-axis')
ylabel('y-axis')
title ('Secant method')
legend('Root','(2*x^2 + 3 * log(x) - 1)')
```

OUTPUT:



For the problem given keeping values and solving:

```
R = 1.618;
T = 340;
a = 364;
b = 0.03;
f = @(x) ((R*T)/(x-b)) - (a/(x*(x+b)+b*(x-b)));
low = 0.5;
high = 0;

[xx, yy] = Secant(f, low, high, 0.00001, 20);
```

```
 step     x(k-1)     x(k)    x(k+1)     y(k+1)      Dx(k+1
    1.0000    0.5000          0    0.4998 -134.1506    0.4998

    2.0000         0    0.4998    0.4997 -134.5789   -0.0002

    3.0000    0.4998    0.4997    0.5542  -22.7598    0.0545

    4.0000    0.4997    0.5542    0.5653   -4.7043    0.0111

    5.0000    0.5542    0.5653    0.5682   -0.2173    0.0029

    6.0000    0.5653    0.5682    0.5683   -0.0022    0.0001

    7.0000    0.5682    0.5683    0.5683   -0.0000    0.0000

secant method has converged
```

```
disp([xx, yy]);
```

```
    0.5683   -0.0000
```