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MATH 4500
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Here is the code and the results for my project 1, which was computer problems 1 and 4 in Section 3.1.

type bisec.m

```
function y = bisec(f,a,b,T,S)
% y = bisect(f,a,b,D,E)
%This is a bisection algorithm by Alexander Winkles used to find roots of
% polynomials over a domain.
%
% f : the function being evaluated
% a : the lower domain value
% b : the upper domain value
% T : the tolerance of the final result
% S : the number of iterations

if sign(feval(f,a))==sign(feval(f,b))
    disp('Error: f(a) and f(b) have the same signs.');
```

```
else
    i = 0;
    while i <= S
        e = b - a;
        e = e/2;
        c = a + e;
        if feval(f,c) == 0 || abs(feval(f,c)) < T
            y = c;
            fprintf('\nThe solution is %d.\n The computation was a success after %d iterations!',y,i)
            break;
        end;
        i = i+1;
        if sign(feval(f,a))==sign(feval(f,c))
            a = c;
        else
            b = c;
        end;
    end;
    if i == S+1
        fprintf('Method failed after %d iterations.',S)
    end;
end;
```

Problems:

1a.

$f = @(x) \frac{1}{x} - \tan(x);$

```
bisec(f,0,pi/2,1e-5,200)
```

```
The solution is 8.603355e-01.
```

```
The computation was a success after 16 iterations!
```

```
ans =
```

```
0.8603
```

```
1b.
```

```
f=@(x) 1/x - 2^x
```

```
f =
```

```
@(x)1/x-2^x
```

```
bisec(f,0,1,1e-5,100)
```

```
The solution is 6.411858e-01.
```

```
The computation was a success after 17 iterations!
```

```
ans =
```

```
0.6412
```

```
1c.
```

```
f=@(x) 2^(-x)+exp(x) + 2*cos(x)-6;
```

```
bisec(f,1,3,1e-5,100)
```

```
The solution is 1.829384e+00.
```

```
The computation was a success after 17 iterations!
```

```
ans =
```

```
1.8294
```

```
1d.
```

```
f=@(x) (x.^3+4*x.^2+3*x+5)/(2*x.^3-9*x.^2+18*x-2);
```

```
bisec(f,0,4,1e-5,100)
```

```
Method failed after 100 iterations.
```

```
4.
```

```
f=@(x) x.^8-36*x.^7+546*x.^6-4536*x.^5+22449*x.^4-67284*x.^3+118124*x.^2-109584*x+40320
```

```
f =
```

```
@(x)x.^8-36*x.^7+546*x.^6-4536*x.^5+22449*x.^4-67284*x.^3+118124*x.^2-109584*x+40320
```

```
bisec(f,5.5,6.5,1e-5,100)
```

The solution is 6.

The computation was a success after 0 iterations!

```
ans =
```

```
6
```

```
f=@(x) x.^8-36.001*x.^7+546*x.^6-4536*x.^5+22449*x.^4-67284*x.^3+118124*x.^2-109584*x+40320
```

```
f =
```

```
@(x)x.^8-36.001*x.^7+546*x.^6-4536*x.^5+22449*x.^4-67284*x.^3+118124*x.^2-109584*x+40320
```

```
bisec(f,5.5,6.5,1e-5,100)
```

Error: f(a) and f(b) have the same signs.

```
diary off
```