Matlab Notes for Math 210 Homework 7

I started out using the clearvars command because I ran this program many times and it wouldn't give up the larger dimensions for some of its variables when I wanted to make them smaller without the clearvars command. I am choosing two arbitrary 2 x 2 symmetric matrices and using the interval from -20 to 20 just to see how it would be different from -8 to 8.

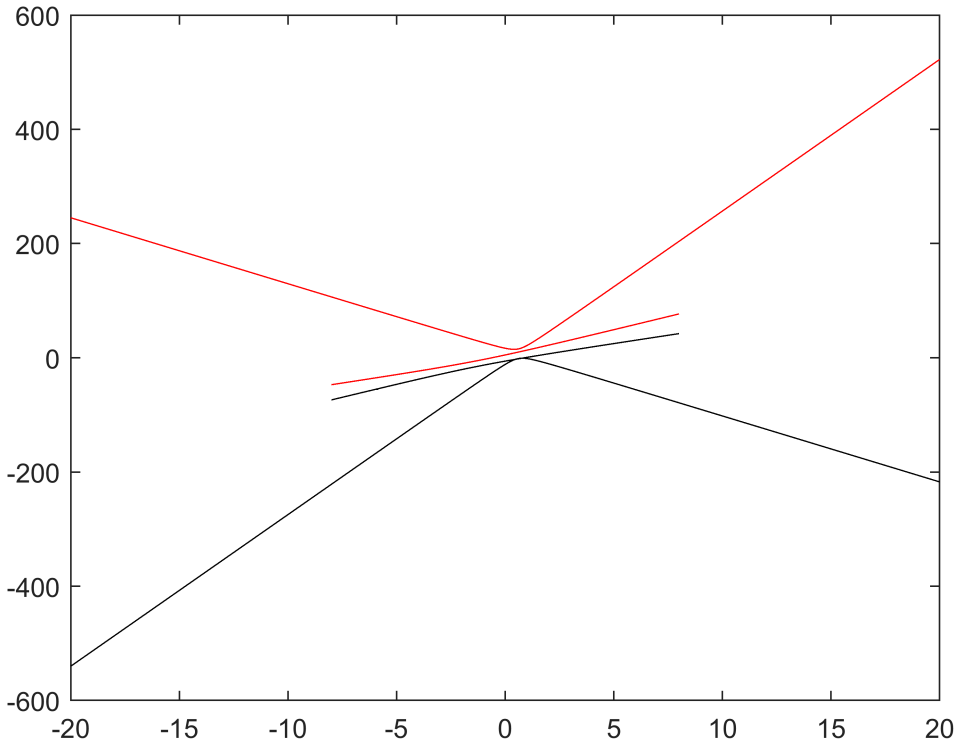
```
clearvars
A=[10 12; 12 -5]
```

```
A = 2×2
    10    12
    12    -5
```

```
B=[9 -19;-19 6]
```

```
B = 2×2
     9   -19
   -19     6
```

```
i=0;                        %This will be the component number
for k=-20:0.1:20            %you may want to vary the increment for better accuracy
    i=i+1;
    [V,D]=eig(A+k*B);
    D1(i)=D(1,1);           %this is the smaller eigenvalue
    D2(i)=D(2,2);
end
x=-20:0.1:20;               %The increment must match the earlier one.
plot(x,D1,'k')
hold on
plot(x,D2,'r')
```



D2 > D1, so D2 - D1 > 0. this will give an estimate of the minimum.

```
M=min(D2-D1)
```

```
M = 16.8428
```

The exact minimum distance between eigenvalues is the square root of the discriminant of the 2 x 2 matrix for the right value of t. The radican is tau^2-4Delta. we need the value of t that makes it a minimum. the minimum has to be positive by the spectral theorem.

```
fun=@(t)sqrt(trace(A+t*B)^2-4*det(A+t*B))
```

```
fun = function_handle with value:
    @(t)sqrt(trace(A+t*B)^2-4*det(A+t*B))
```

```
T=fminbnd(fun,-20,20)
```

```
T = 0.5967
```

```
fun(T)
```

```
ans = 16.8423
```