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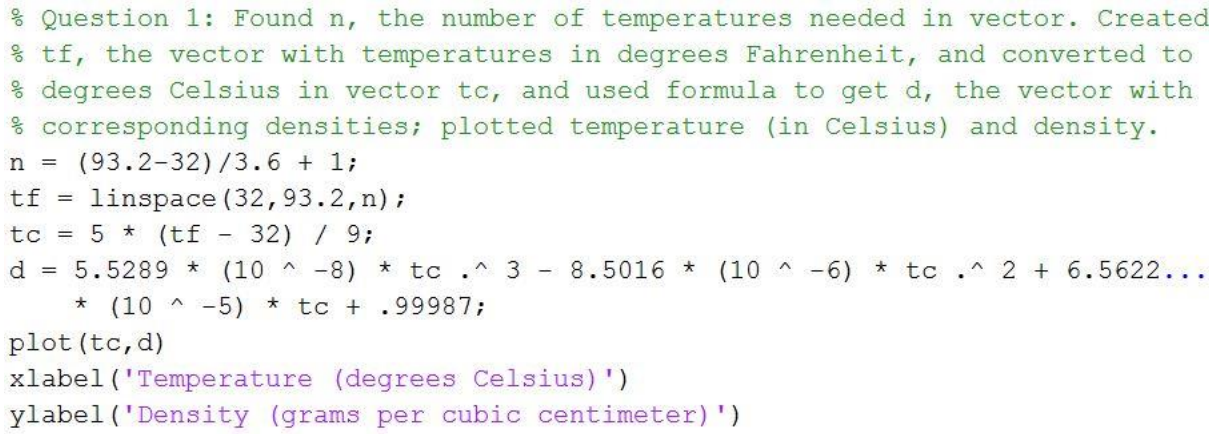
MATH 320
9 September 2016

Homework 1

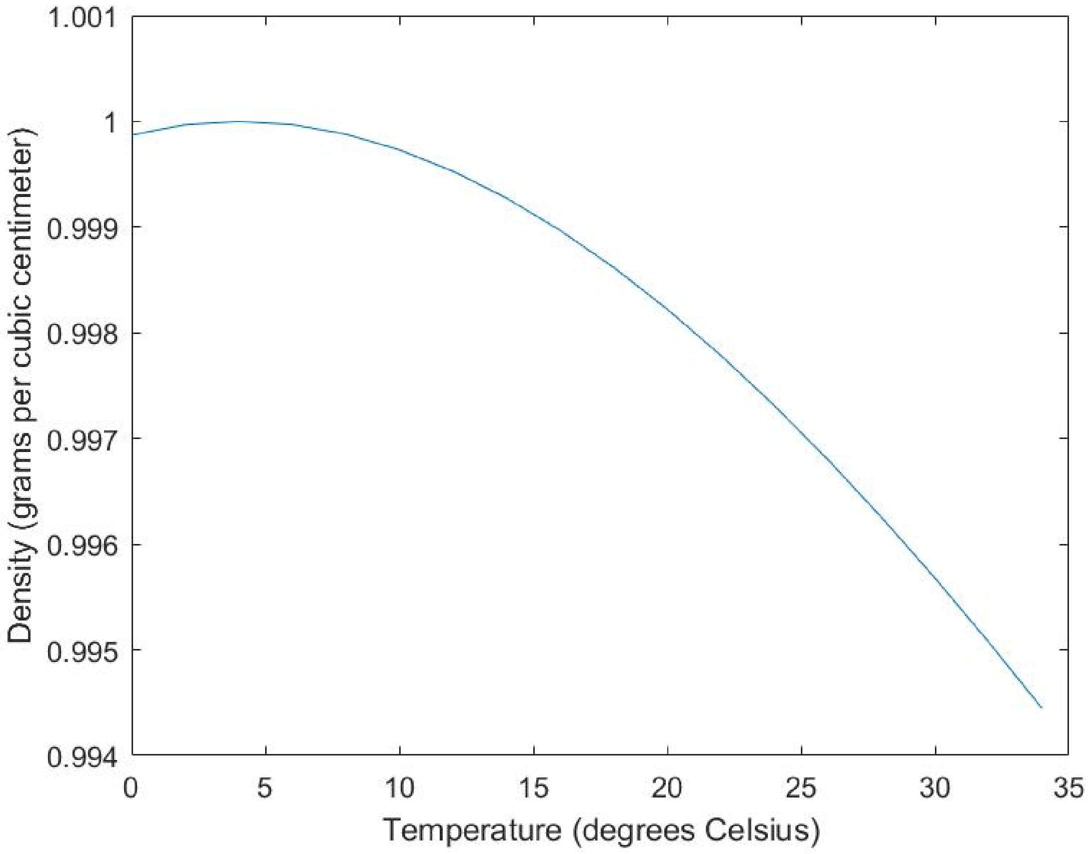
1. (Problem 2.9)

Code and description:

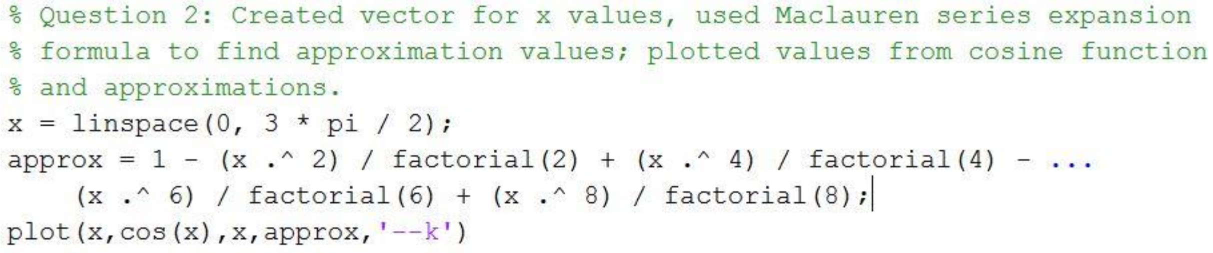


```
% Question 1: Found n, the number of temperatures needed in vector. Created
% tf, the vector with temperatures in degrees Fahrenheit, and converted to
% degrees Celsius in vector tc, and used formula to get d, the vector with
% corresponding densities; plotted temperature (in Celsius) and density.
n = (93.2-32)/3.6 + 1;
tf = linspace(32,93.2,n);
tc = 5 * (tf - 32) / 9;
d = 5.5289 * (10 ^ -8) * tc .^ 3 - 8.5016 * (10 ^ -6) * tc .^ 2 + 6.5622...
    * (10 ^ -5) * tc + .99987;
plot(tc,d)
xlabel('Temperature (degrees Celsius)')
ylabel('Density (grams per cubic centimeter)')
```

Output:

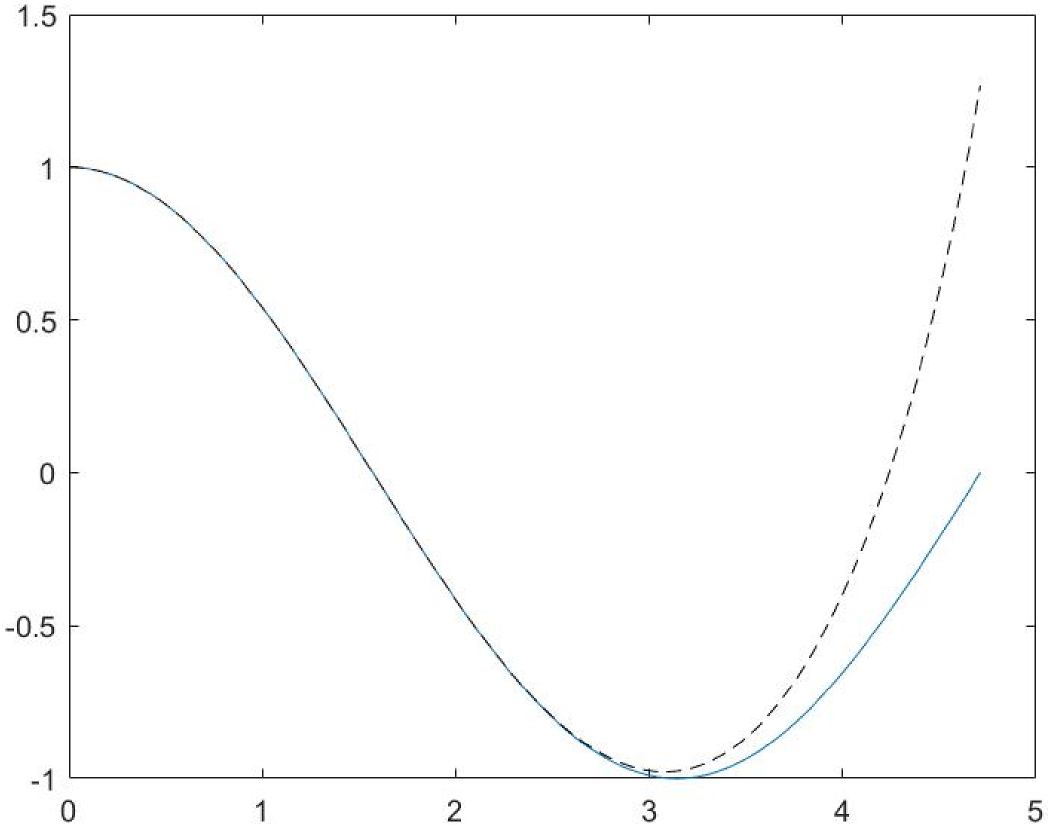


2. (Problem 2.15)
Code and description:

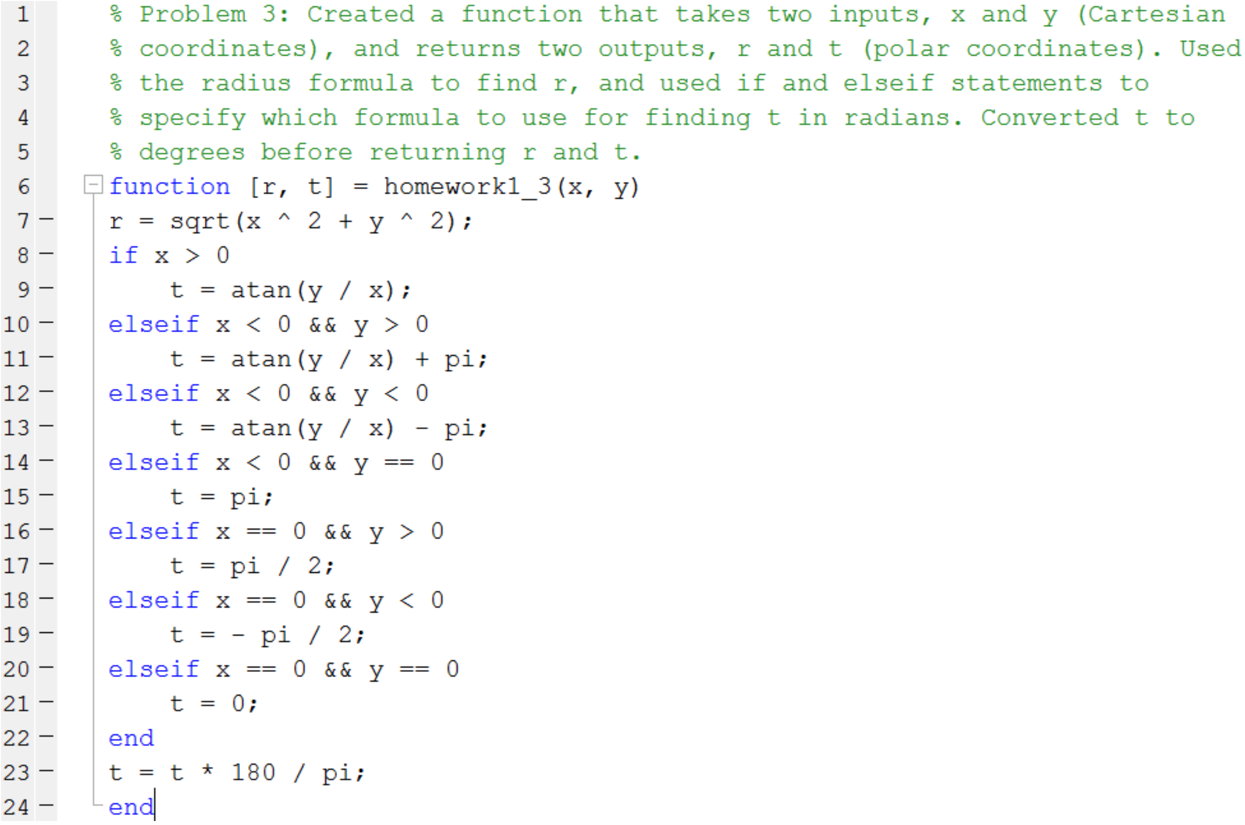


```
% Question 2: Created vector for x values, used Maclauren series expansion
% formula to find approximation values; plotted values from cosine function
% and approximations.
x = linspace(0, 3 * pi / 2);
approx = 1 - (x .^ 2) / factorial(2) + (x .^ 4) / factorial(4) - ...
    (x .^ 6) / factorial(6) + (x .^ 8) / factorial(8);
plot(x,cos(x),x,approx,'--k')
```

Output:

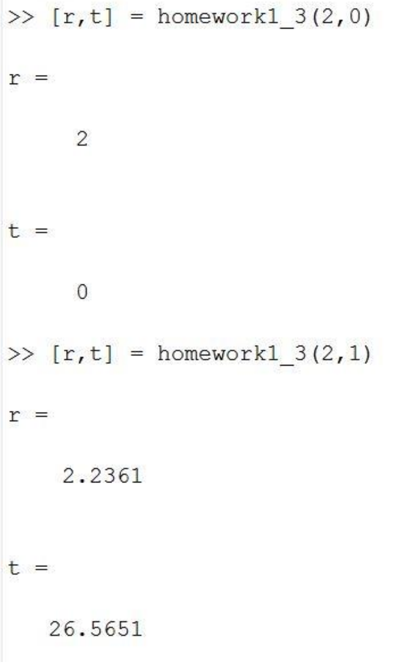


3. (Problem 3.6)

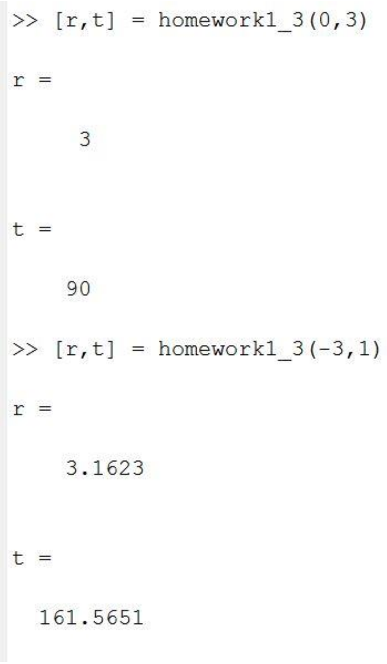


```
% Problem 3: Created a function that takes two inputs, x and y (Cartesian
% coordinates), and returns two outputs, r and t (polar coordinates). Used
% the radius formula to find r, and used if and elseif statements to
% specify which formula to use for finding t in radians. Converted t to
% degrees before returning r and t.
function [r, t] = homework1_3(x, y)
r = sqrt(x ^ 2 + y ^ 2);
if x > 0
    t = atan(y / x);
elseif x < 0 && y > 0
    t = atan(y / x) + pi;
elseif x < 0 && y < 0
    t = atan(y / x) - pi;
elseif x < 0 && y == 0
    t = pi;
elseif x == 0 && y > 0
    t = pi / 2;
elseif x == 0 && y < 0
    t = - pi / 2;
elseif x == 0 && y == 0
    t = 0;
end
t = t * 180 / pi;
end
```

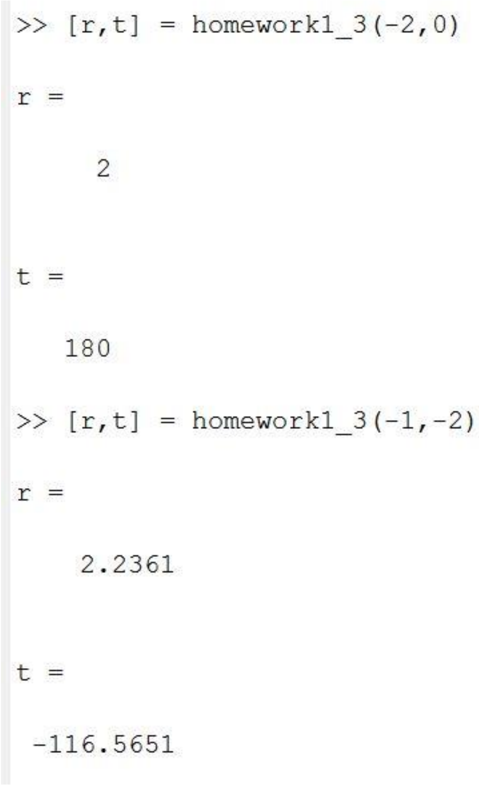
Output (Test cases):



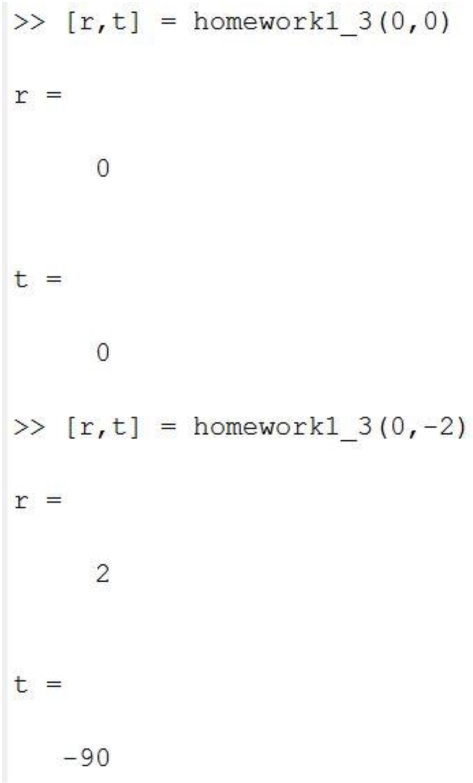
```
>> [r,t] = homework1_3(2,0)

r =

     2


t =

     0

>> [r,t] = homework1_3(2,1)

r =

    2.2361


t =

   26.5651
```



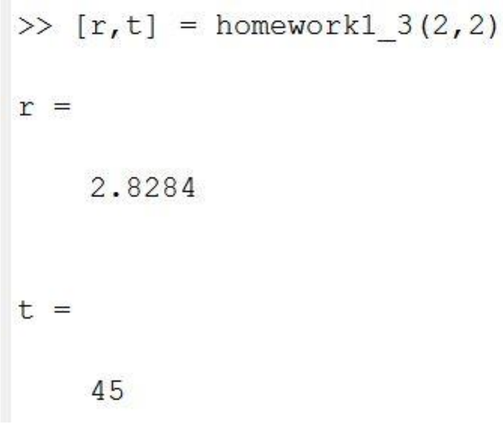
```
>> [r,t] = homework1_3(0,3)

r =

     3


t =

    90

>> [r,t] = homework1_3(-3,1)

r =

    3.1623


t =

  161.5651
```



```
>> [r,t] = homework1_3(-2,0)

r =

     2


t =

   180

>> [r,t] = homework1_3(-1,-2)

r =

    2.2361


t =

 -116.5651
```



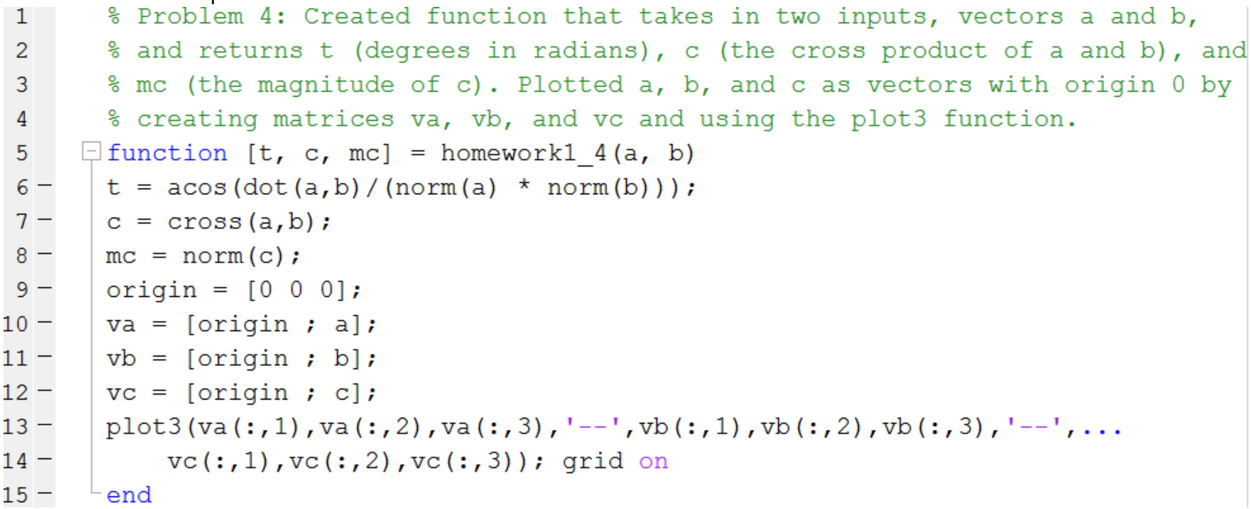
```
>> [r,t] = homework1_3(0,0)

r =

     0


t =

     0

>> [r,t] = homework1_3(0,-2)

r =

     2


t =

   -90
```



```
>> [r,t] = homework1_3(2,2)

r =

    2.8284


t =

    45
```

4. (Problem 3.20)

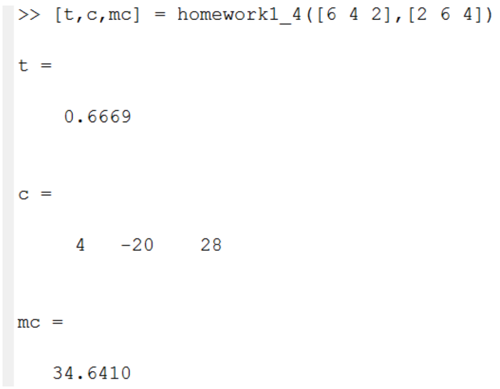
Code and description:



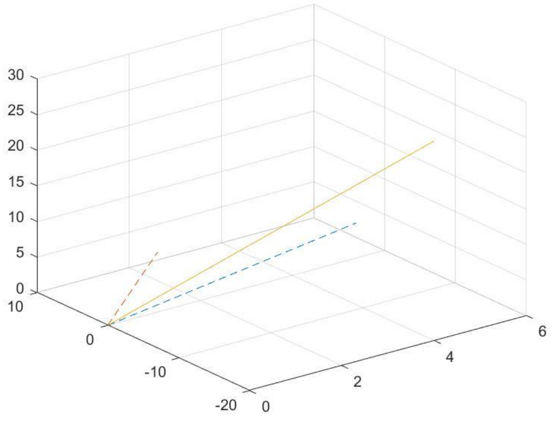
```
% Problem 4: Created function that takes in two inputs, vectors a and b,
% and returns t (degrees in radians), c (the cross product of a and b), and
% mc (the magnitude of c). Plotted a, b, and c as vectors with origin 0 by
% creating matrices va, vb, and vc and using the plot3 function.
function [t, c, mc] = homework1_4(a, b)
t = acos(dot(a,b)/(norm(a) * norm(b)));
c = cross(a,b);
mc = norm(c);
origin = [0 0 0];
va = [origin ; a];
vb = [origin ; b];
vc = [origin ; c];
plot3(va(:,1),va(:,2),va(:,3),'--',vb(:,1),vb(:,2),vb(:,3),'--',...
    vc(:,1),vc(:,2),vc(:,3)); grid on
end
```

Output:

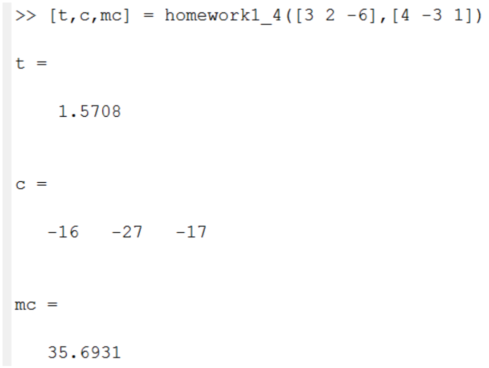
(a)



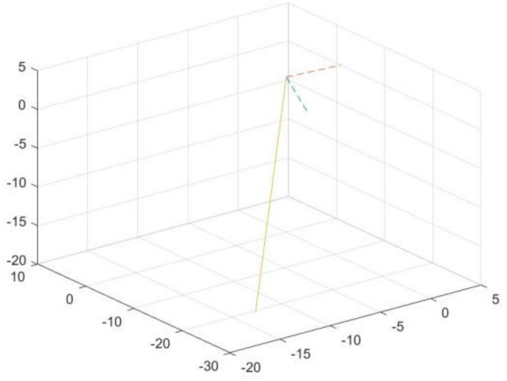
```
>> [t,c,mc] = homework1_4([6 4 2],[2 6 4])

t =

    0.6669


c =

     4   -20    28


mc =

   34.6410
```



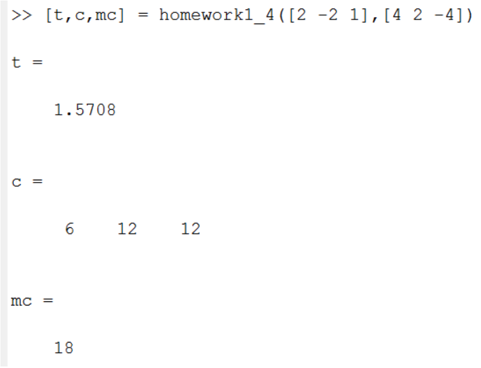
(b)



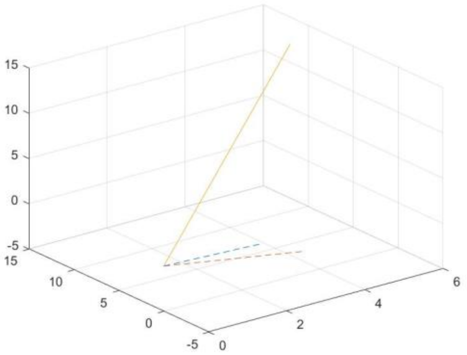
```
>> [t,c,mc] = homework1_4([3 2 -6],[4 -3 1])

t =

    1.5708


c =

   -16   -27   -17


mc =

   35.6931
```



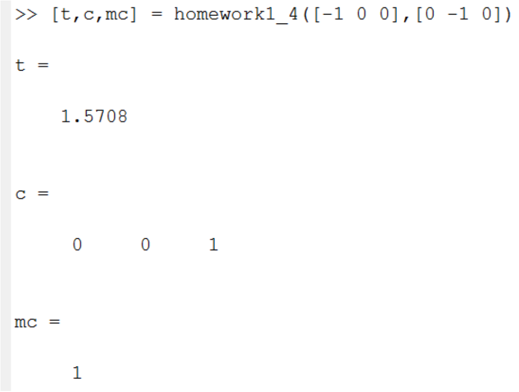
(c)



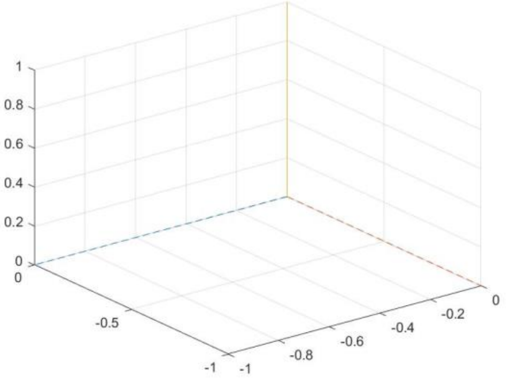
```
>> [t,c,mc] = homework1_4([2 -2 1],[4 2 -4])

t =

    1.5708


c =

     6    12    12


mc =

    18
```



(d)



```
>> [t,c,mc] = homework1_4([-1 0 0],[0 -1 0])

t =

    1.5708


c =

     0     0     1


mc =

     1
```


1
0.8
0.6
0.4
0.2
0
0
-0.5
-1
-1
-0.8
-0.6
-0.4
-0.2
0