

Faculty of Engineering and Technology

Electrical and Computer Engineering Department

Electromagnetics 1 (ENEE 3408)

**MATLAB Assignments**

**Prepared by**

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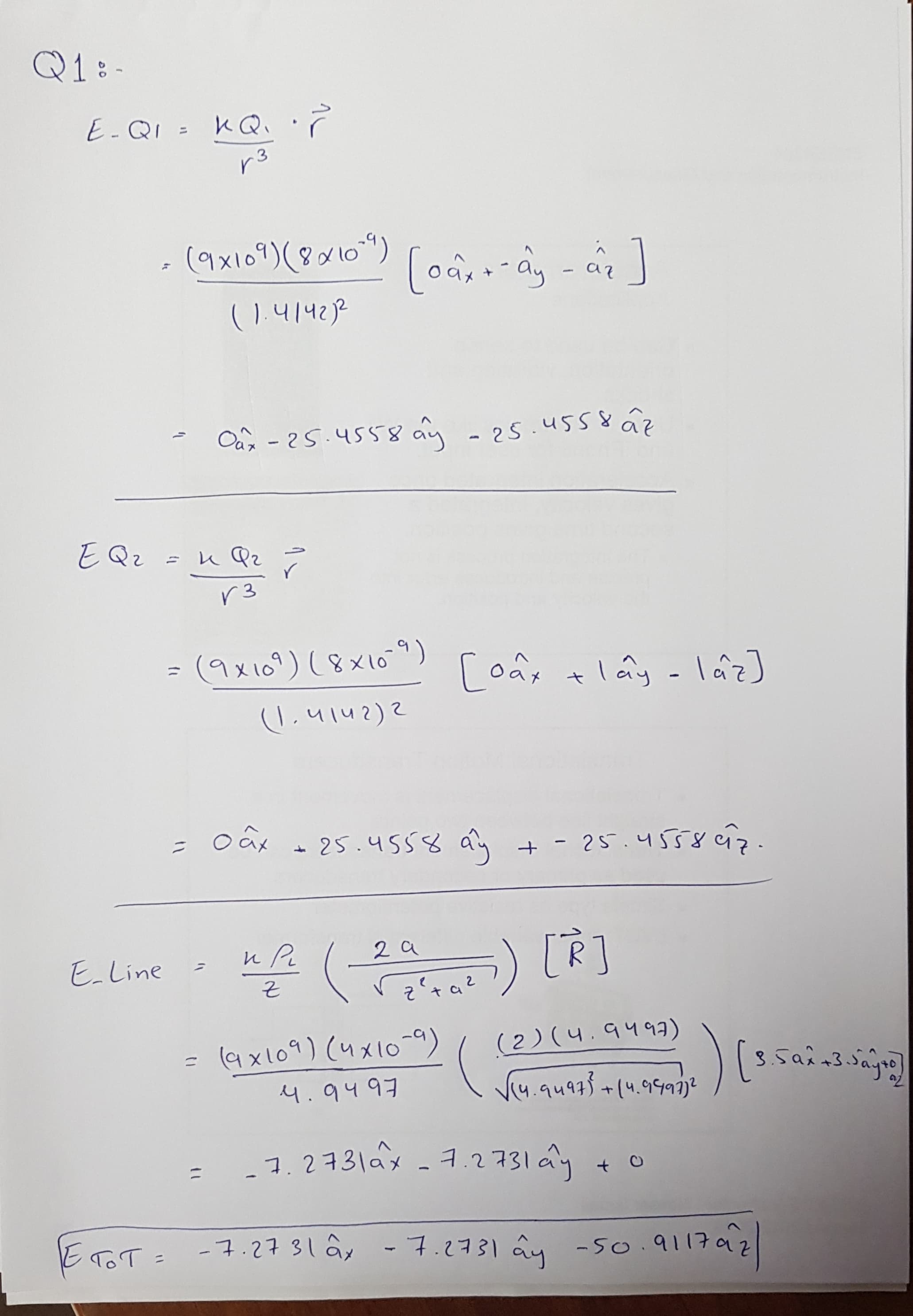
**Section No. 1**

Instructor

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Code:

clear;

clc;

Q1 = 8e-9;

Q2 = 8e-9;

ro\_L = 4e-9;

line\_initial\_point = [7 0 0];

line\_final\_point = [0 7 0];

Point\_Q1 = [0 1 1];

Point\_Q2 = [0 -1 1];

Point\_EF = [0 0 0];

epsilon = (1e-9/(36\*pi));

k = (1/(4\*pi\*epsilon));

R\_Q1E = Point\_EF - Point\_Q1;

R\_Q2E = Point\_EF - Point\_Q2;

R\_LIP = (Point\_EF - line\_initial\_point);

R\_line = (line\_final\_point - line\_initial\_point);

Mag\_R\_Q1E = norm(R\_Q1E);

Mag\_R\_Q2E = norm(R\_Q2E);

Mag\_R\_line = norm(R\_line);

Mag\_LIP = norm(line\_initial\_point);

cos\_theta = (dot(R\_line , R\_LIP)/(Mag\_R\_line\*Mag\_LIP));

sin\_theta = sqrt(1-(cos\_theta)^2);

z = Mag\_LIP\*sin\_theta

a = Mag\_LIP\*cos\_theta;

b = Mag\_R\_line - a;

Point\_z = [3.5 3.5 0];

Mag\_z\_vector = norm(Point\_z);

R\_z = (Point\_EF - Point\_z)./(Mag\_z\_vector);

EQ1 = (k\*Q1/(Mag\_R\_Q1E)^3).\*R\_Q1E;

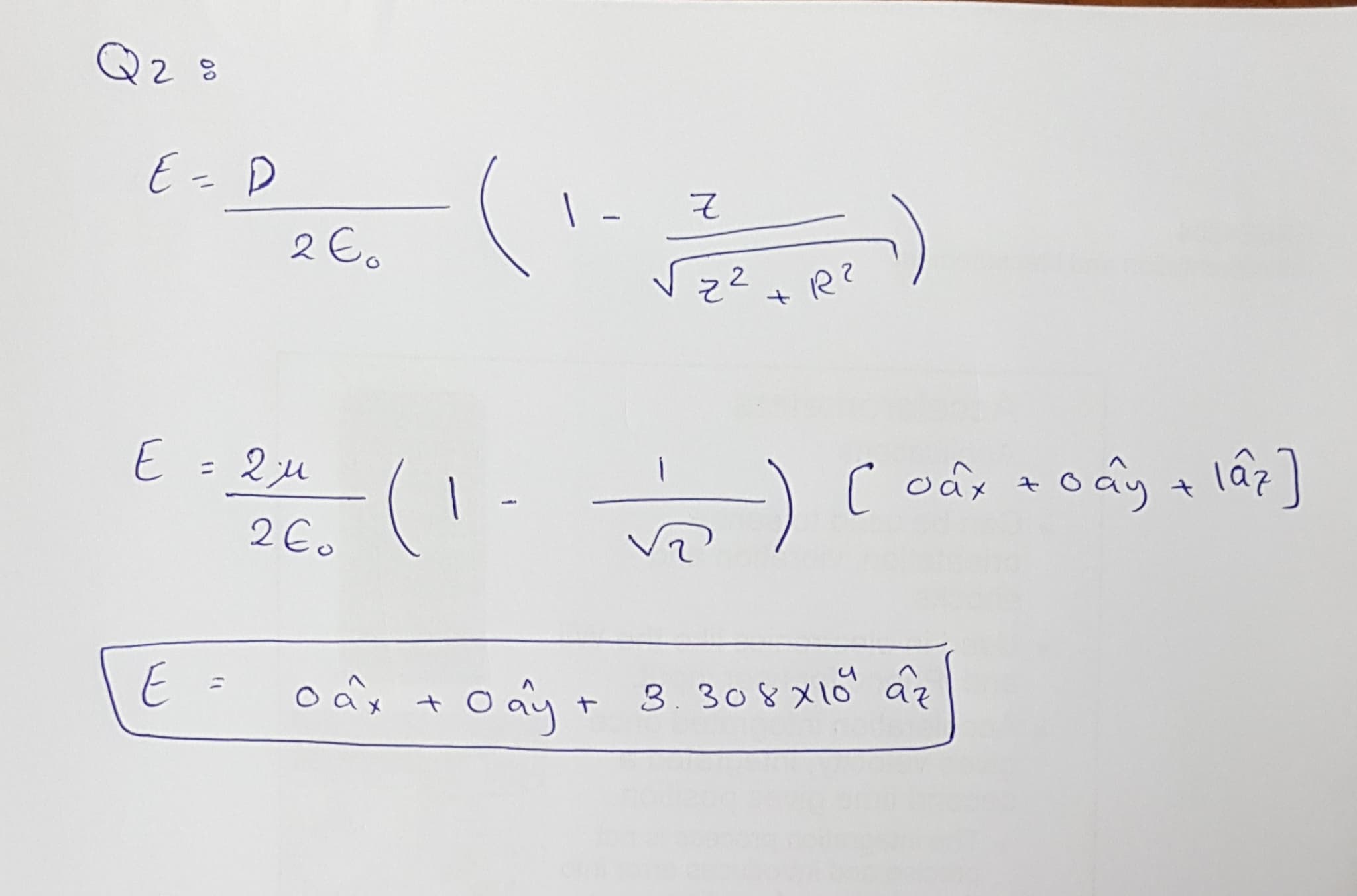
EQ2 = (k\*Q2/(Mag\_R\_Q2E)^3).\*R\_Q2E;

E\_line = (k\*ro\_L/z)\*((b/sqrt(z^2 + b^2))+(a/sqrt(z^2 + a^2)))\*R\_z

E\_Tot = EQ1 + EQ2 + E\_line

Result

= **-7.2731 -7.2731 -50.9117**



Code:

clc;

clear;

Epsilono=8.854e-12;

D=2e-6;

P=[0 1 0];

R = 1;

Z = 1;

E =(D/(2\*Epsilono))\*(1-(Z/(sqrt(Z^2+R^2))));

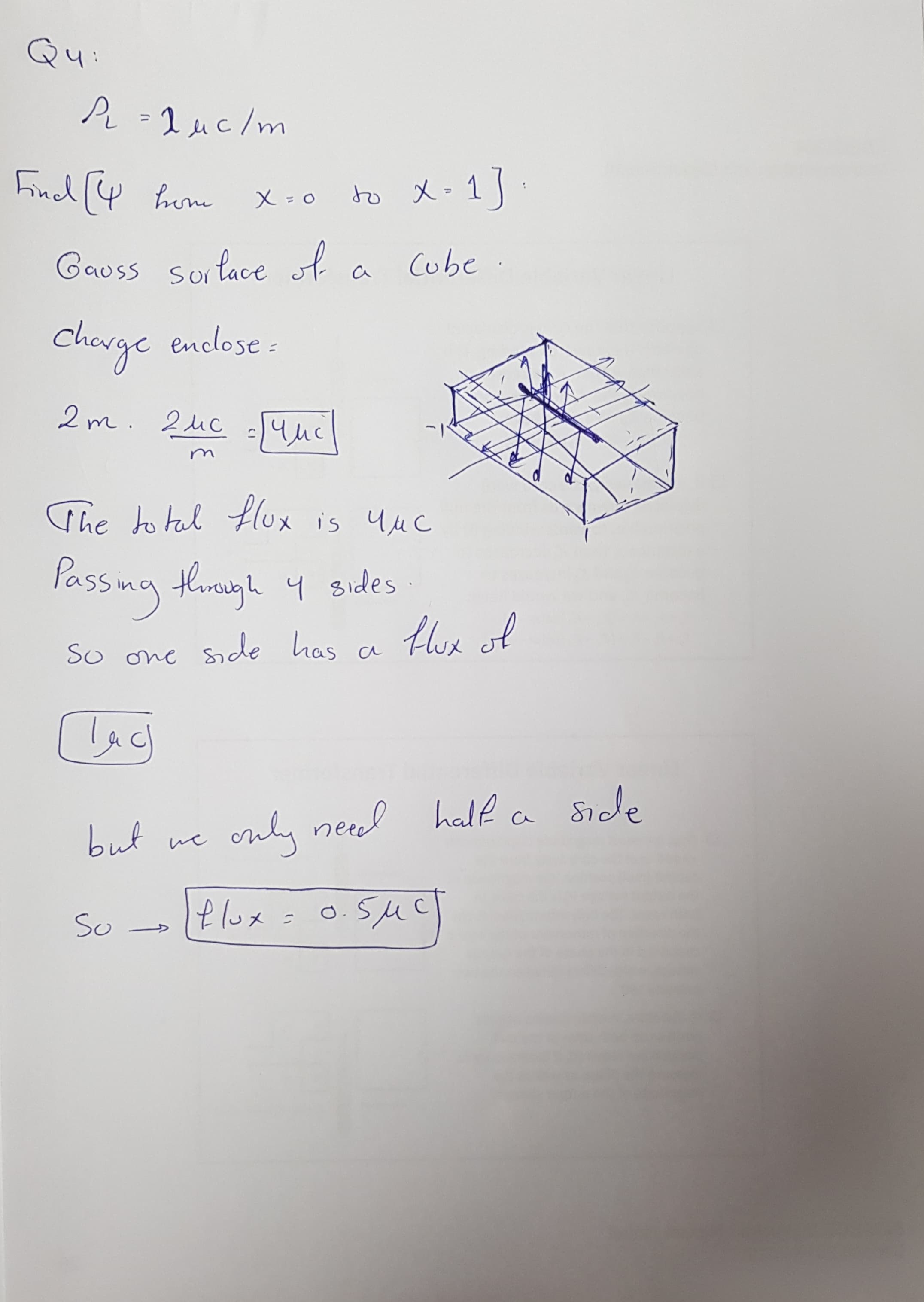
E\_tot = E.\*[0 0 1]

Result =

E\_tot =

1.0e+04 \*

0 0 3.3080



Code:

clc; %clear the command line

clear; %remove all previous variables

ro\_L = 2e-6;

L\_start = [0 -1 1];

L\_end = [0 1 1];

Line = L\_end - L\_start;

Mag\_Line = norm(Line);

Total\_Charge\_Q = ro\_L\*Mag\_Line;

Line\_Charges = 10000;

Q = Total\_Charge\_Q/Line\_Charges;

az=[0 0 1]; % unit vector in the z direction

x\_lower=0; %the lower boundary of x of the plane

x\_upper=1; % the upper boundary of x of the plane

y\_lower=-100; %the lower boundary of y of the plane

y\_upper=100; %the upper boundary of y of the plane

Number\_of\_x\_Steps=20; %step in the x direction

Number\_of\_y\_Steps=1000; %step in the y direction

dx=(x\_upper-x\_lower)/Number\_of\_x\_Steps; %the x increment

dy=(y\_upper-y\_lower)/Number\_of\_y\_Steps; %the y increment

dP = Mag\_Line/Line\_Charges;

flux=0; %initialize the flux to 0

y1 = 4\*pi;

ds = dx\*dy;

for p = -1+dP : dP : 1-dP

for j=1:Number\_of\_y\_Steps

for i=1:Number\_of\_x\_Steps

x = x\_lower+0.5\*dx+(i-1)\*dx; %x component of the center of a grid

y = y\_lower+0.5\*dy+(j-1)\*dy; %y component of the center of a grid

P = [x y 0]; %the center of a grid

C = [0 p 1];

R = P-C; %vector R is the vector pointing from the point charge

RMag = norm(R); %magnitude of R

R\_Hat = R/RMag; %unit vector in the direction of R

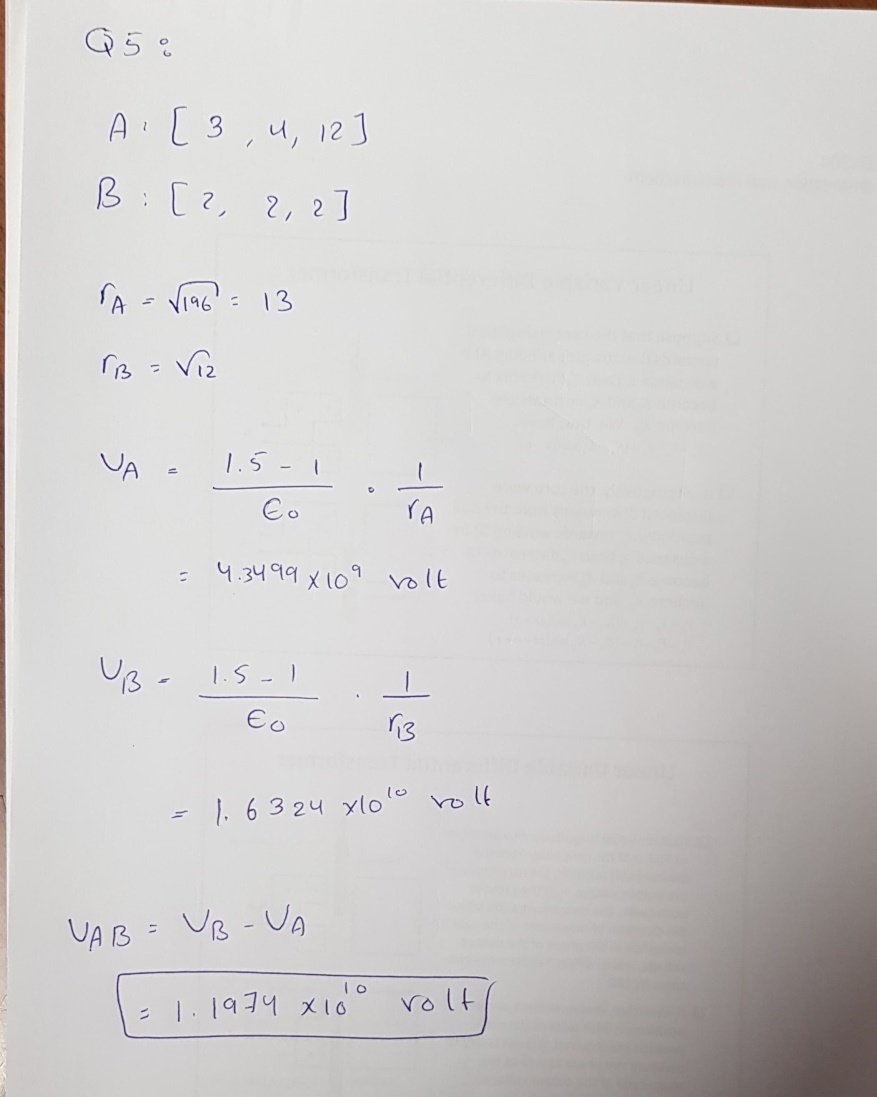
flux = flux + Q\*ds\*(-1\*R\_Hat(3))/(y1\*RMag^2end

end

end

flux =

4.9995e-07



Code:

clear;

clc;

epsilon = (1e-9/(36\*pi));

A = [3 4 12];

B = [2 2 2];

r\_A = norm(A);

r\_B = norm(B);

VA = (0.5/epsilon)\*(1/r\_A)

VB = (0.5/epsilon)\*(1/r\_B)

VAB = VB – VA

VAB =

1.1974e+10