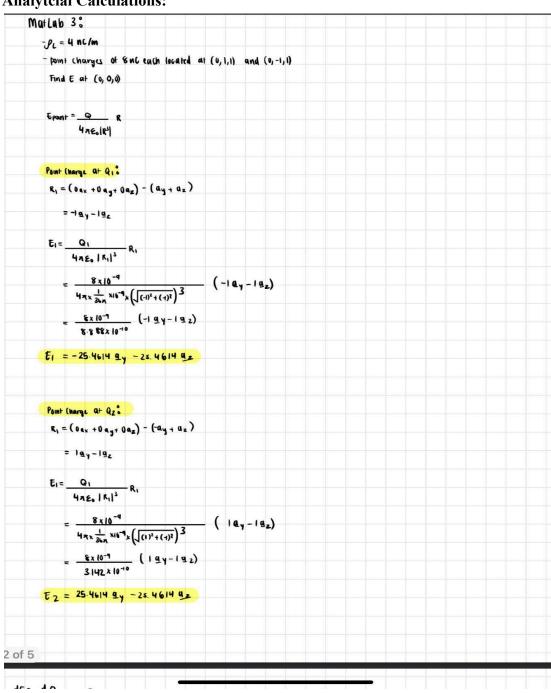
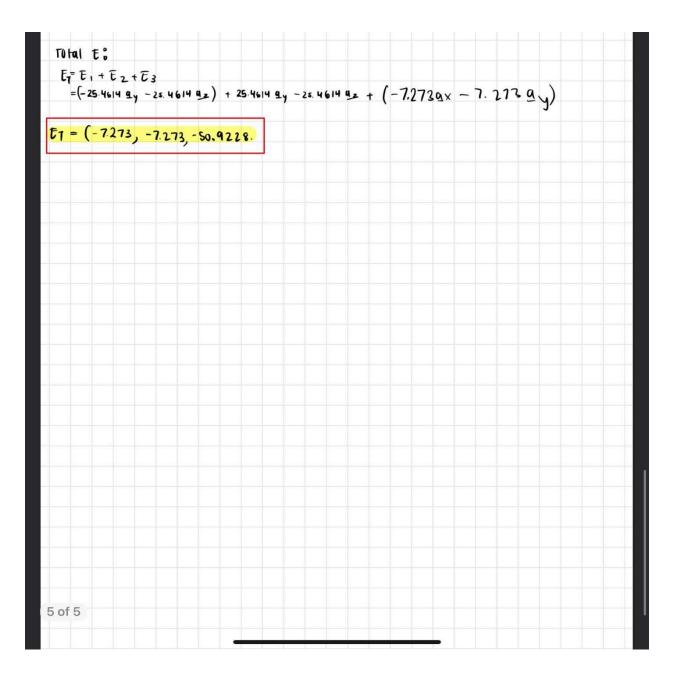
Jenisha Thevarajah 400473218 thevaj5

Analytcial Calculations:



dex=desino dey=decoso de split into a components	
\(\chi^{\chi^2}\) \(\chi^2 \tau^2\)	
dε = <u>dQ</u> = <u>β dL</u> 4πε ₀ R ² 4πε ₀ R ²	
$d_{E_{x}} = \underbrace{P_{L} dL}_{4\pi e_{h}(x^{2}+y^{2})} \cdot \underbrace{\frac{x}{\sqrt{x^{2}+y^{2}}}}_{\sqrt{x^{2}+y^{2}}}$	
$dE_{\chi} = \int_{0}^{7} dE_{\chi} = \frac{\rho_{\chi}}{4\pi\epsilon_{0}} \int_{0}^{7} \frac{dy}{(x_{+}^{2}y_{-}^{2})^{3/2}}$	
(x²+y²) x	
b) Px . (\frac{1}{\lambda^2 \sqrt{x^2 \tau^2 \tau^2}} \] \frac{7}{6} \Rightarrow \text{E}_x = \frac{7\rho}{\lambda}	
Ha c . 2 (100 mm)	
Thurstore) S Ey = 7p	
for y 5 Ey = 70	
47 60 y2 12749	
Ex= 7 x 4 x 10-9	
$(4\pi)\left(\frac{1}{36\pi}x^{10^{-4}}\right)\left(7\cdot\sqrt{7^{2}+44}\right)$	
Ex = 3.6365	
$E_y = \frac{7 \times 4 \times 10^{-9}}{}$	
$(4\pi)\left(\frac{1}{3\sqrt{\pi}} \times 10^{-9}\right)\left(7 \cdot \sqrt{7^2 + 49}\right)$	
Ex = 3. 6365	
$E = E_X + E_Y$ $R = (0-x) g_x + (0-y) g_y$	+ (0-0)92
- 7.273	
F. (3.22) (
EL= (7.273) (-19x-194)	
EL = (-7.273, -7.273, 0)	
4 of 5	



MATLAB CODE:

```
| Move here to reveal toolstrip |
Q1=8e-9;%charges on Q1
Q2=8e-9;%charges on Q2
pL=4e-9;%charge density of the line
Epsilono=8.8419e-12;%Permitivity of free space
P=[0 0 0];%coordinates of observation point
A=[0 1 1];%coordinates of Q1
B=[0 -1 1];%coordinates of Q2
C=[3.5 3.5 0];%coordinates of the center of the line charge
Number_of_L_Steps=100000;%the steps of L
R1=P-A; %the vector pointing from Q1 to the observation point
R2=P-B; %the vector pointing from Q2 to the observation point
R1Mag=norm(R1);%the magnitude of R1
R2Mag=norm(R2);%the magnitude of R1
E1=Q1/(4*pi*Epsilono*R1Mag^3)*R1;%the electric field generated by Q1
E2=Q2/(4*pi*Epsilono*R2Mag^3)*R2;%the electric field generated by Q2
%%the following routine calculates the electric field at the
%observation point generated by the line charge
% the following routine calculates the electric field at the
% observation point generated by the line charge
D = norm(P-C); % the distance from the observation point to the center of the line
L = sqrt(98)*D; % the length of the line
length = sqrt(98);
dir_vec = [-7/sqrt(98) 7/sqrt(98) 0];
dL = length/Number_of_L_Steps;
dL_Vector = dL*dir_vec;
EL = [0 0 0]; % initialize the electric field generated by EL
C_segment = C - (Number_of_L_Steps/2 * dL_Vector - dL_Vector/2);% the center of the first segment
for i = 1:Number_of_L_Steps
   R = P - C segment;
   RMag = norm(R); % the magnitude of the vector R
   EL = EL + dL * pL / (4 * pi * Epsilono * (RMag)^3) * R; % get contribution from each segment
   C_segment = C_segment + dL_Vector; % the center of the i-th segment
E = E1 + E2 + EL; % the electric field at P
disp('ETotal: ');
disp(E);
```

Output:

>> assignment3

E:

-7.2731 -7.2731 -50.9119