Phys 3010 Mathematical Physics
Assignment 15

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1. Find the centre of mass of a square of side a and uniform thickness, lying in the x-y plane with one corner at the origin, if the density varies as $\rho = \rho_o (x/a)^2$.

2. If the electric field is given by $\mathbf{E} = \sin(z)\ \mathbf{j}$, calculate the electric flux crossing the triangle defined by the points (x,y,x) = (0,0,0), (4,0,0), and (0,0,3). (Hint: draw a diagram. Note also that your limits are not going to be constant.)

3. Find the magnetic flux passing though the surface of a cylinder of radius a, with $-L<z<+L$ if $\mathbf{B}=B_o\mathbf{i}$.

4. Given a force $\mathbf{F} = (xy+2)\mathbf{i} + (x+z)\mathbf{j} + x^2\mathbf{k}$, find the work done in moving from the origin to the point (4,4,1)
   a. Along the path (0,0,0)→(4,0,0)→(4,4,0)→(4,4,1)
   b. Along the path (0,0,0)→(0,4,0)→(0,4,1)→(4,4,1)
   c. Along the straight line between the initial and final points.
   d. Along the curved path defined by the pair of equations $5x = y^2+y = 20z$.