HOMEWORK I

1- Calculate the dot products of unit vectors given below?

a) $\vec{a_\rho}\cdot\vec{a_y}$ b) $\vec{a_R}\cdot\vec{a_z}$ c) $\vec{a_\phi}\cdot\vec{a_x}$

2- Calculate the cross products of unit vectors given below?

a) $\vec{a_R}\times\vec{a_z}$ b) $\vec{a_\rho}\times\vec{a_y}$

3- For $\vec{A} = 3\vec{a_x} + 2\vec{a_y} - 1\vec{a_z}$

$\vec{B} = \vec{a_x} - 4\vec{a_y}$

$\vec{C} = 2\vec{a_x} - 5\vec{a_z}$

Calculate

a) $\vec{a}_A$ (which is the unit vector of $\vec{A}$)

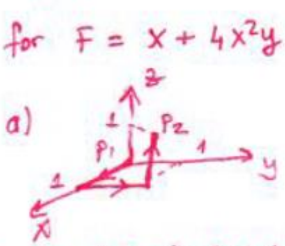
b) the component of $\vec{A}$ in the direction of $\vec{C}$

c) $\vec{A}\cdot(\vec{B}\times\vec{C})$, $\vec{A}\times(\vec{B}\times\vec{C})$, $\vec{B}\cdot\vec{A}\cdot\vec{C} - \vec{C}\cdot\vec{A}\cdot\vec{B}$

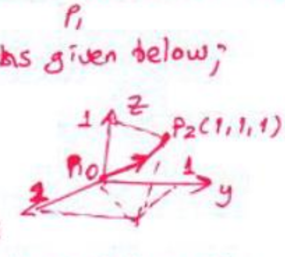
d) θ_{AB} (which is the smaller angle from $\vec{A}$ to $\vec{B}$)

4- Apply fundamental theorem of gradient, that is $\int_{P_1}^{P_2} \nabla F\cdot\vec{dl} = F(P_2) - F(P_1)$

for $F = x + 4x^2y + 2yz^2$ along the paths given below;

a) 

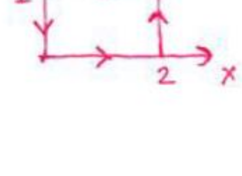
$(0,0,0)\to(1,0,0)\to(1,1,0)\to(1,1,1)$

b) 

along the parabola $z = x^2$, $x = y$

5- Apply Stokes's theorem, that is $\int_S \nabla\times\vec{A}\,\vec{ds} = \oint_C \vec{A}\,\vec{dl}$ for $\vec{A} = 2y\vec{a_x} + x\vec{a_y}$

on the geometries, given below

a) 

b)