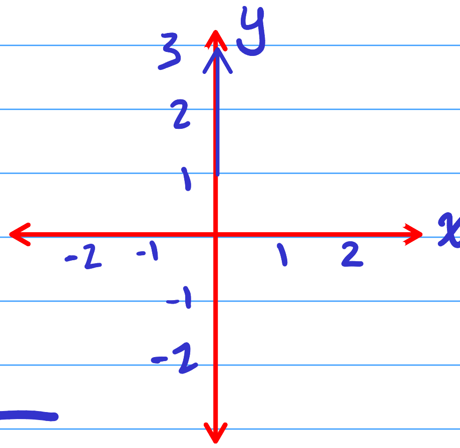
Q3) Sketch the field $\vec{E} = xy\,\vec{a}_x + 2z\,\vec{a}_y + 2y\,\vec{a}_z$ at point P(x=0, y=1, z= 1) in x-y and ρ-z planes. Hence, express $\vec{E_P}$ in cylindrical and spherical coordinates.

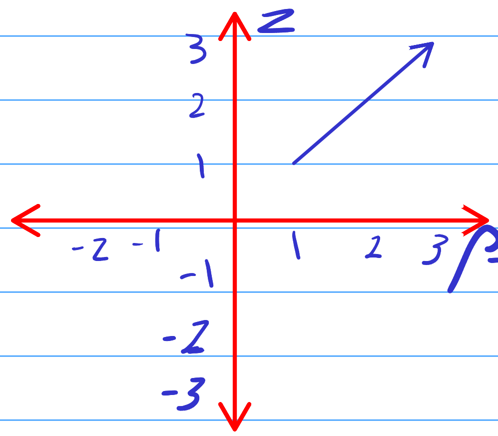
Q4) Sketch the field $\vec{E} = \rho z\,\vec{a}_\rho + \rho^2\vec{a}_z$ at point P(x=0, y=-1, z= 0) in x-y and ρ-z planes. Hence, express $\vec{E_P}$ in Cartesian and spherical coordinates.

Q3

$\vec{E}_p = (0)(1)\vec{a_x} + 2(1)\vec{a_y} + 2(1)\vec{a_z} = 2\vec{a_y} + 2\vec{a_z}$



$\rho = \sqrt{x^2+y^2} = \sqrt{0^2+1^2} = 1 \qquad z = z = 1$



$E_p = 2\vec{a_y} + 2\vec{a_z}$

$\vec{a_y} = \sin\phi\,\vec{a_\rho} + \cos\phi\,\vec{a_\phi}$

$\phi = \tan^{-1}\left(\frac{y}{x}\right) = \frac{\pi}{2}$ 6 $\vec{a_y} = \vec{a_\rho}$

$\vec{E}_p = 2\vec{a_\rho} + 2\vec{a_z}$

	A_ρ	A_ϕ	A_z
A_x	$\cos\phi$	$-\sin\phi$	0
A_y	$\sin\phi$	$\cos\phi$	0
A_z	0	0	1

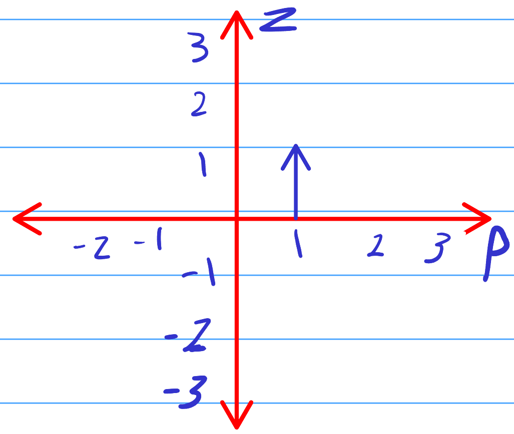
Q3) Sketch the field $\vec{E} = xy\,\vec{a}_x + 2z\,\vec{a}_y + 2y\,\vec{a}_z$ at point P(x=0, y=1, z= 1) in x-y and ρ-z planes. Hence, express $\vec{E}_P$ in cylindrical and spherical coordinates.

Q4) Sketch the field $\vec{E} = \rho z\,\vec{a}_\rho + \rho^2\vec{a}_z$ at point P(x=0, y=-1, z= 0) in x-y and ρ-z planes. Hence, express $\vec{E}_P$ in Cartesian and spherical coordinates.

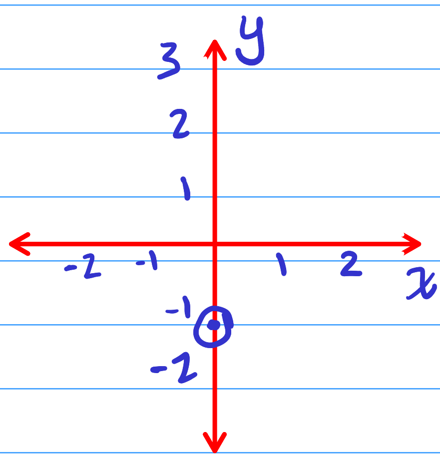
Q4

$\rho = \sqrt{x^2+y^2} = 1$ & $z = z = 0$

$$\vec{E}_P = (1)(0)\,\vec{a}_\rho + (1)^2\,\vec{a}_z = \vec{a}_z$$



$$\vec{E}_P = \vec{a}_z \quad \text{(cartesian)}$$



$$\vec{a}_z = \cos\theta\,\vec{a}_r - \sin\theta\,\vec{a}_\theta$$

$$\theta = \tan^{-1}\left(\frac{\rho}{z}\right) = \tan^{-1}\left(\frac{1}{0}\right) = \frac{\pi}{2}$$

$$\vec{a}_z = -\vec{a}_\theta$$

$$\vec{E}_P = -\vec{a}_\theta$$

cly → sph, ←

	A_r	A_θ	A_ϕ
A_ρ	$\sin\theta$	$\cos\theta$	0
A_ϕ	0	0	1
A_z	$\cos\theta$	$-\sin\theta$	0