

**3.21** Use arrows to sketch each of the following vector fields:

(a)  $\mathbf{E}_1 = \hat{\mathbf{x}}x - \hat{\mathbf{y}}y,$

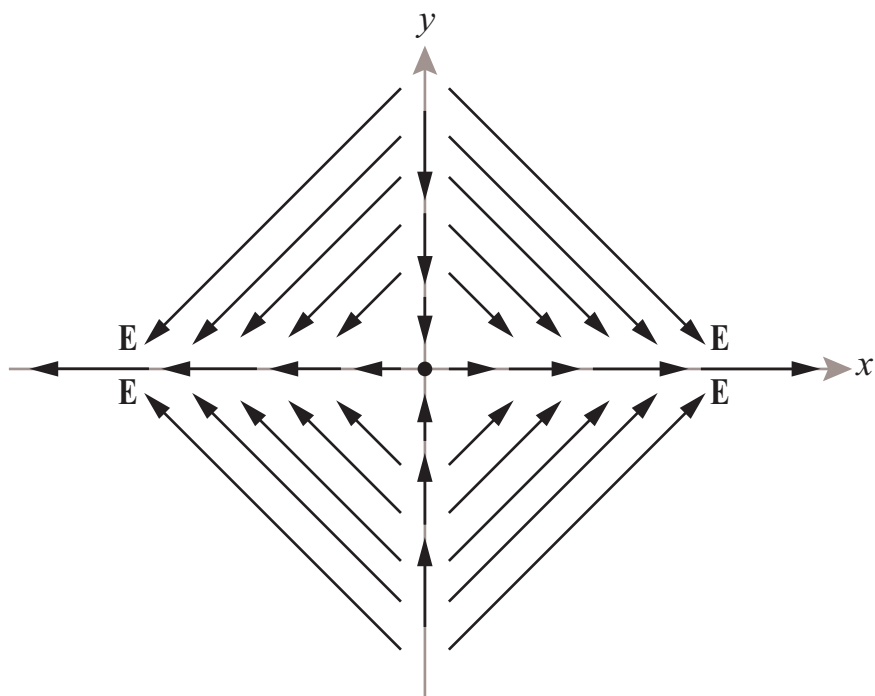
(b)  $\mathbf{E}_2 = -\hat{\boldsymbol{\phi}},$

(c)  $\mathbf{E}_3 = \hat{\mathbf{y}}\frac{1}{x},$

(d)  $\mathbf{E}_4 = \hat{\mathbf{r}}\cos\phi.$

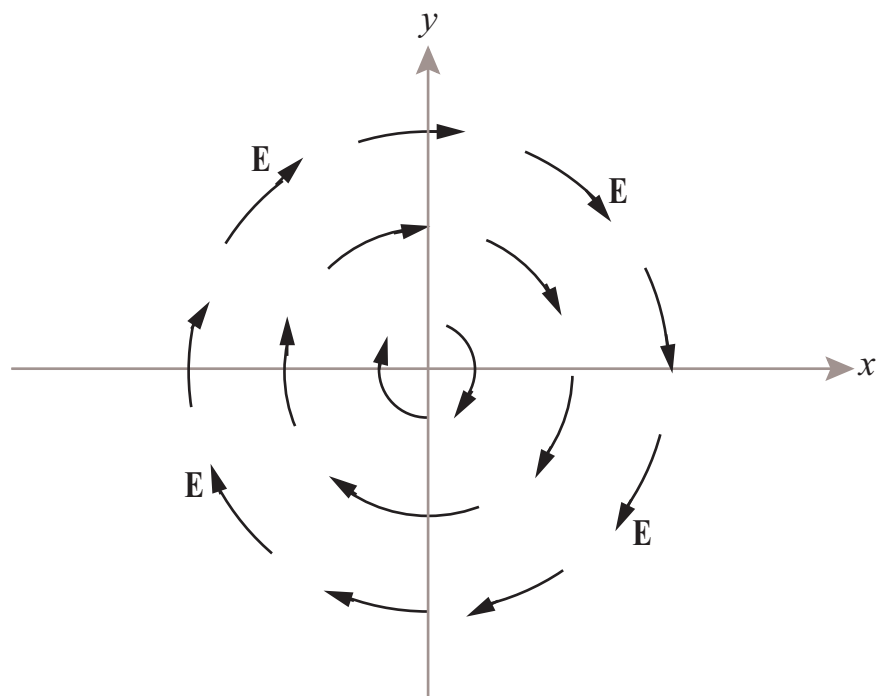
**Solution:**

(a)



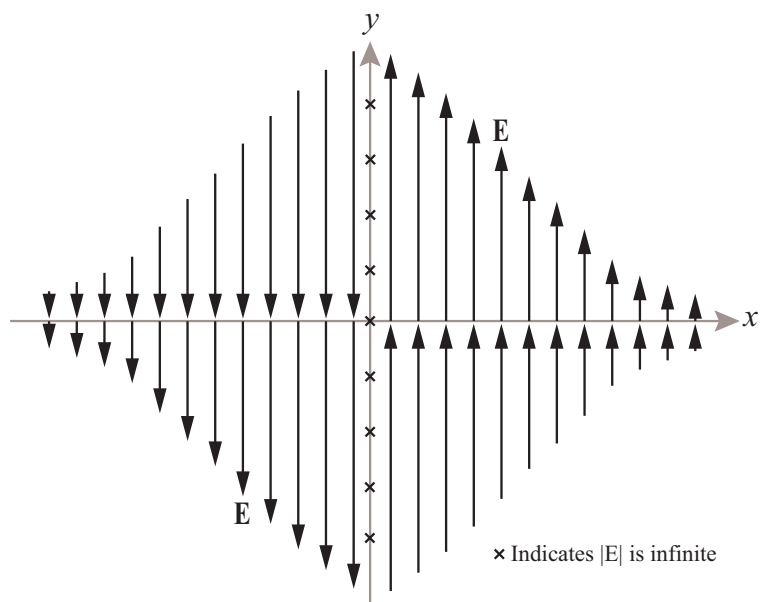
P3.21(a):  $\mathbf{E}_1 = \hat{\mathbf{x}}x - \hat{\mathbf{y}}y$

(b)



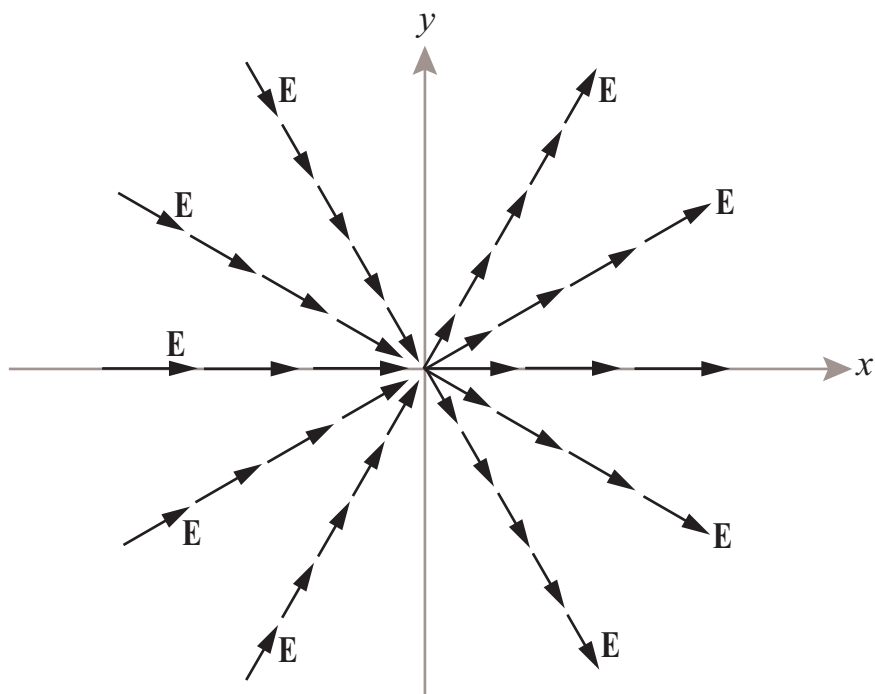
P3.21(b):  $\mathbf{E}_2 = -\hat{\phi}$

(c)



P3.21(c):  $\mathbf{E}_3 = \hat{\mathbf{y}}(1/x)$

(d)



P3.21(d):  $\mathbf{E}_4 = \hat{\mathbf{r}} \cos \phi$

---