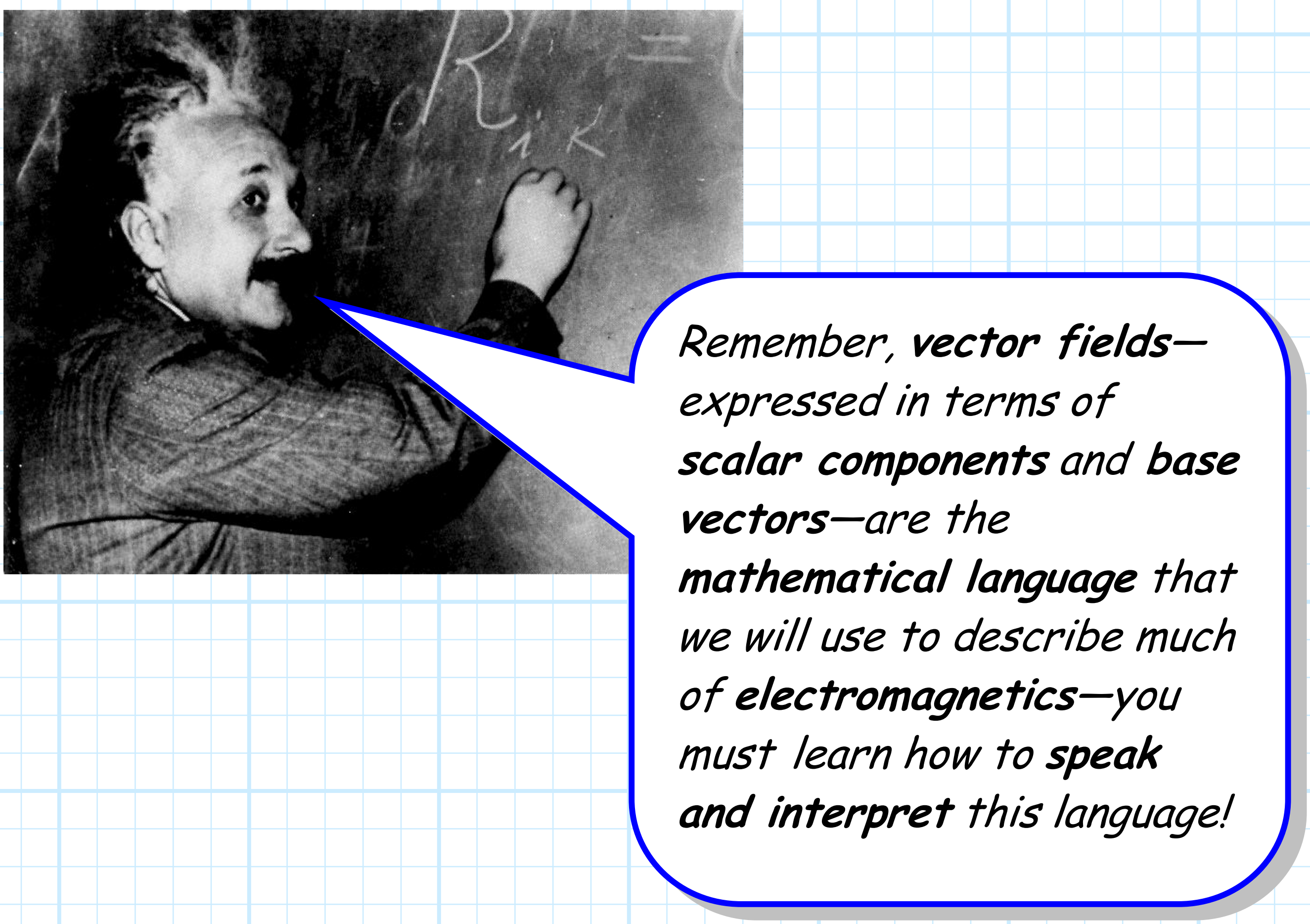
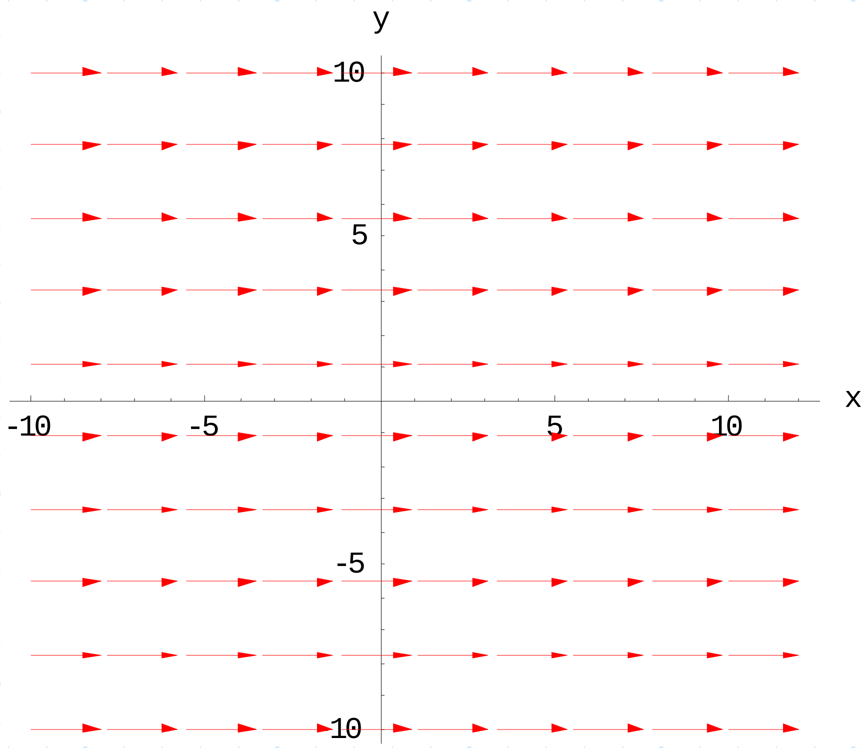
A Gallery of Vector Fields

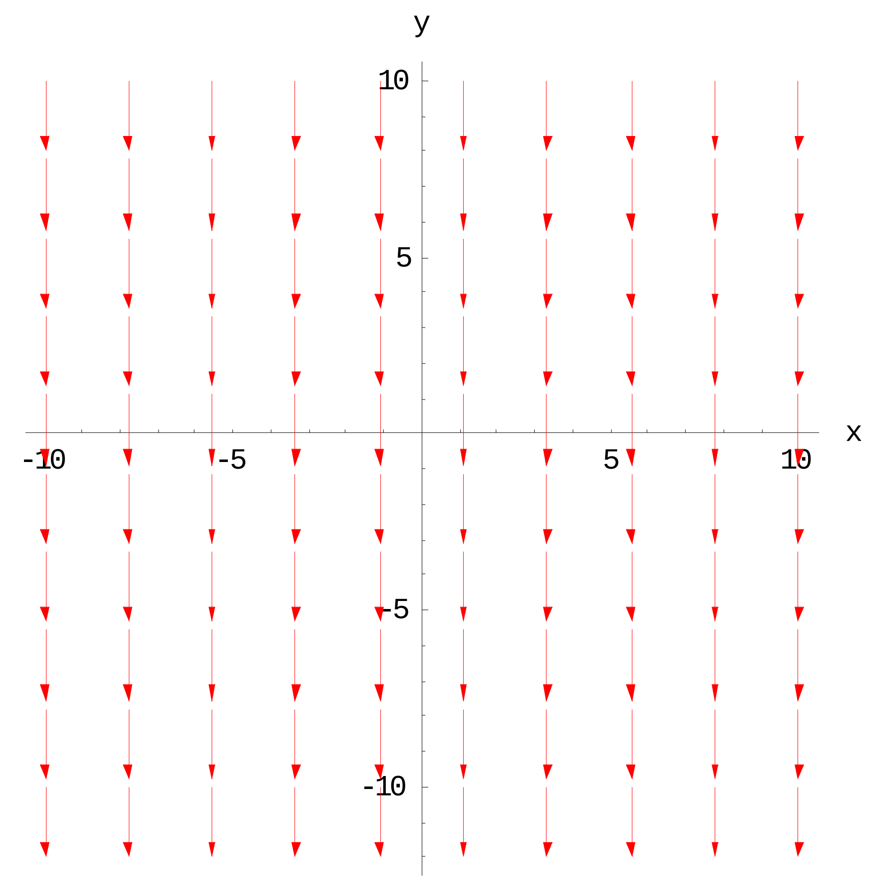
To help **understand** how a vector field relates to its mathematical representation using base vectors, carefully examine and consider these **examples**, plotted on either the ***x-y* plane** (i.e, the plane with all points whose coordinate z=0) or the ***x-z* plane** (i.e, the plane with all points whose coordinate y=0).

Spend some **time** studying each of these examples, until **you** see how the **math** relates to the vector field **plot** and vice versa.

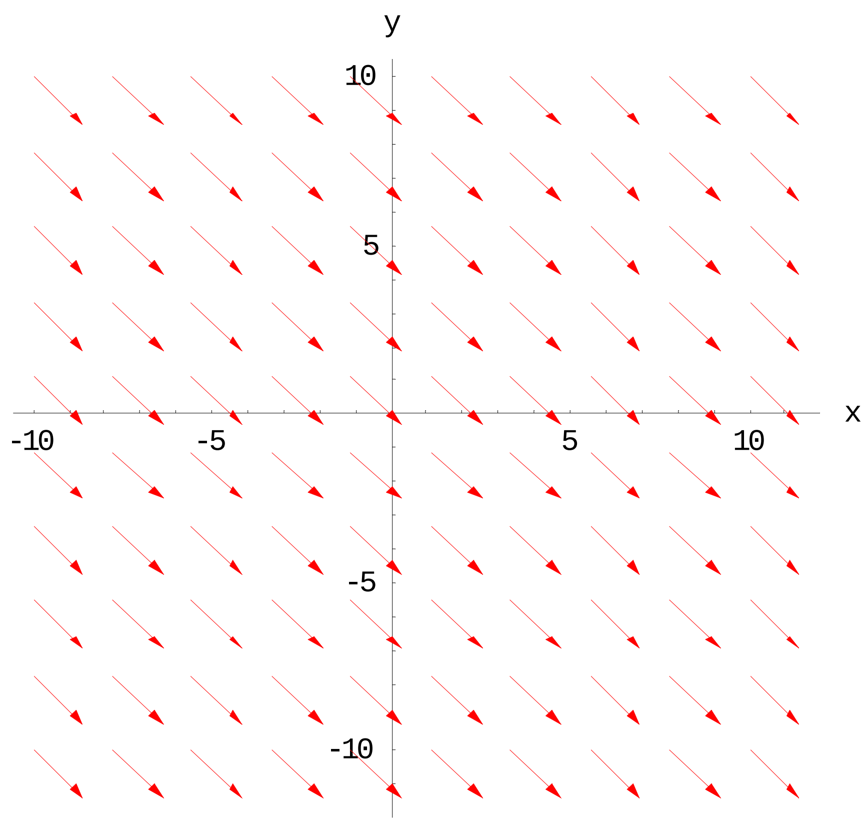




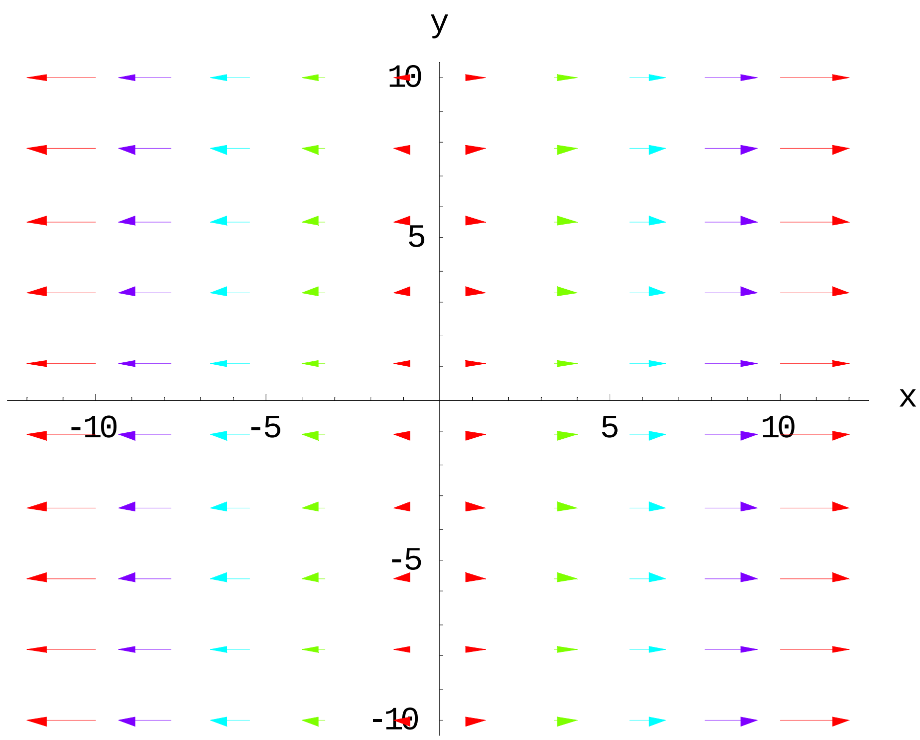
$$\mathbf{A}(\bar{r}) = \hat{\mathbf{a}}_x$$



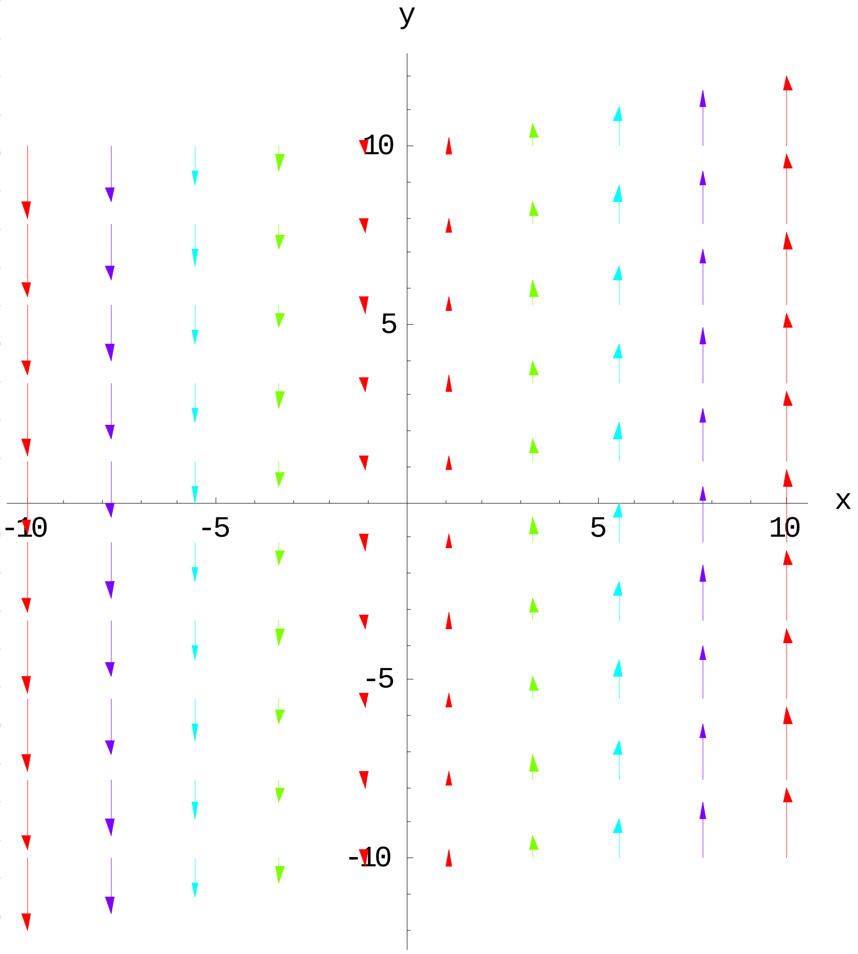
$$\mathbf{A}(\bar{r}) = -\hat{\mathbf{a}}_y$$



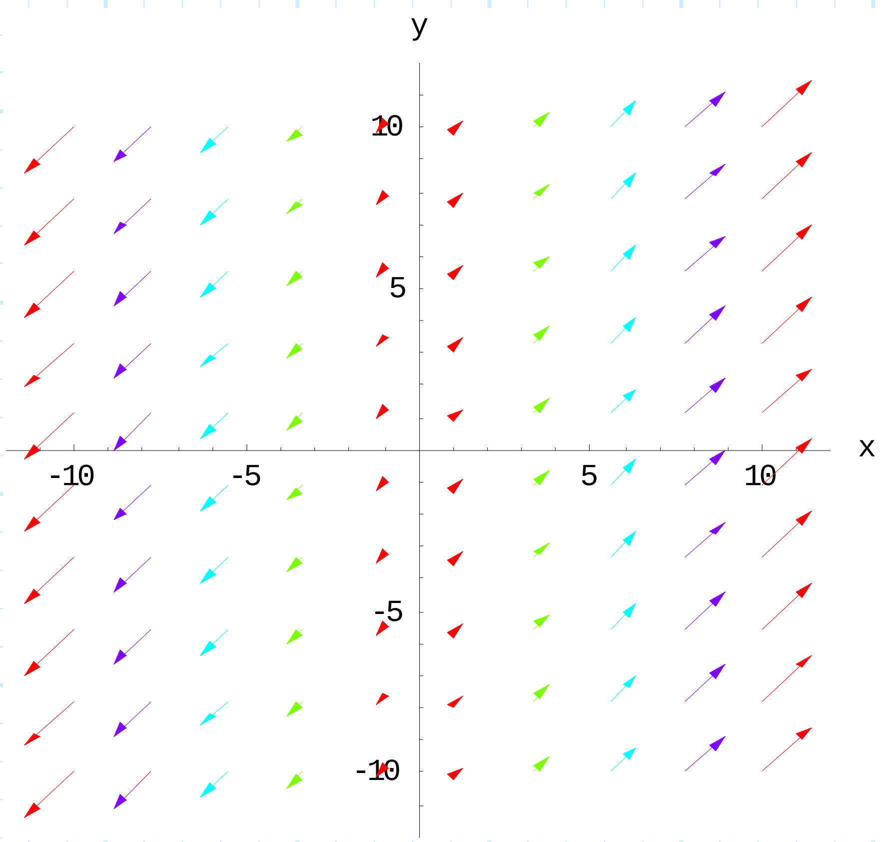
$$\mathbf{A}(\bar{r}) = \hat{a}_x - \hat{a}_y$$



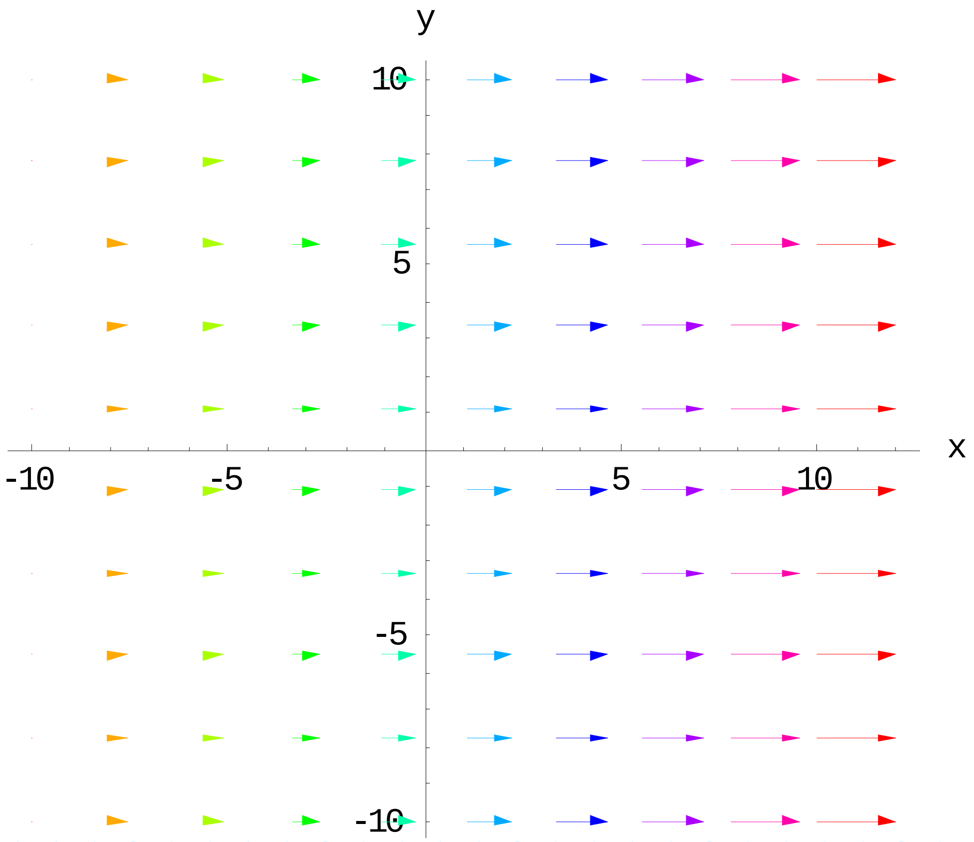
$$\mathbf{A}(\bar{r}) = x\,\hat{a}_x$$



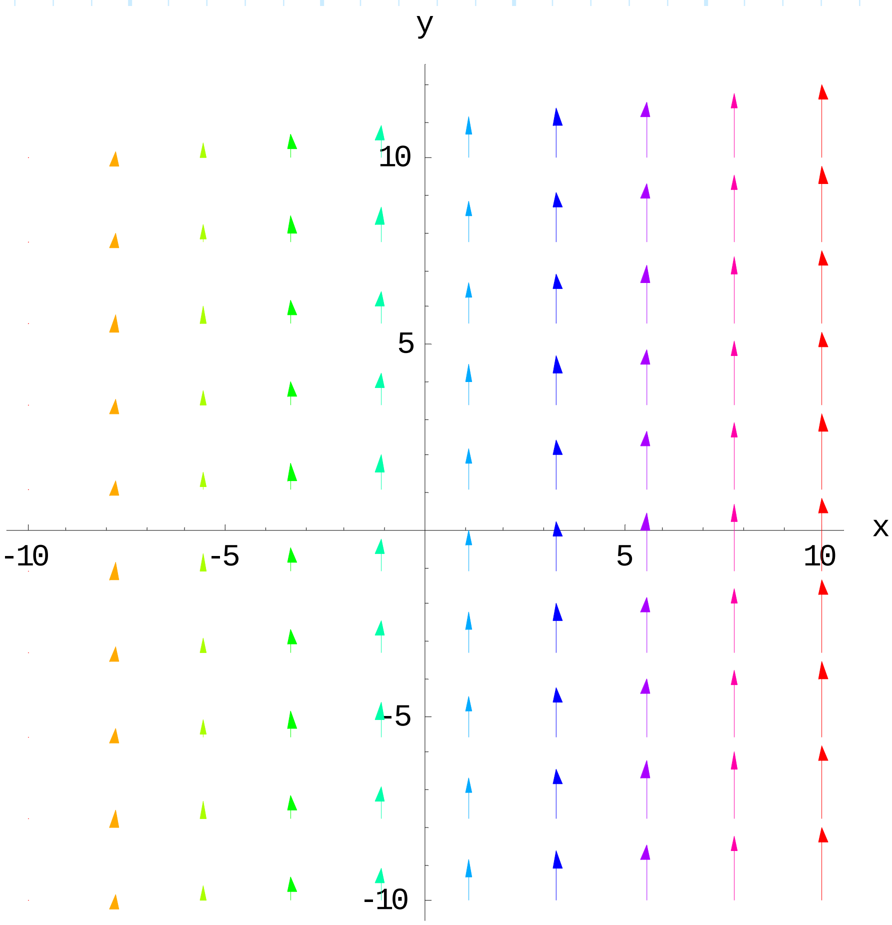
$$\mathbf{A}(\bar{r}) = x\,\hat{\mathbf{a}}_y$$



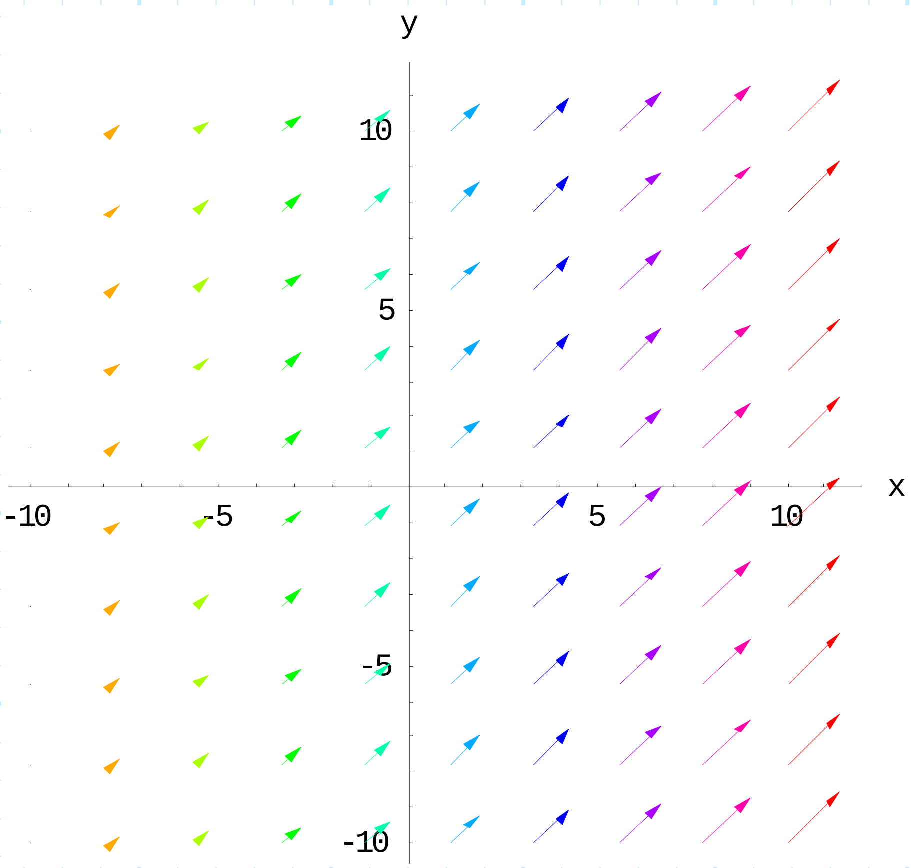
$$\mathbf{A}(\bar{r}) = x\,\hat{\mathbf{a}}_x + x\,\hat{\mathbf{a}}_y$$



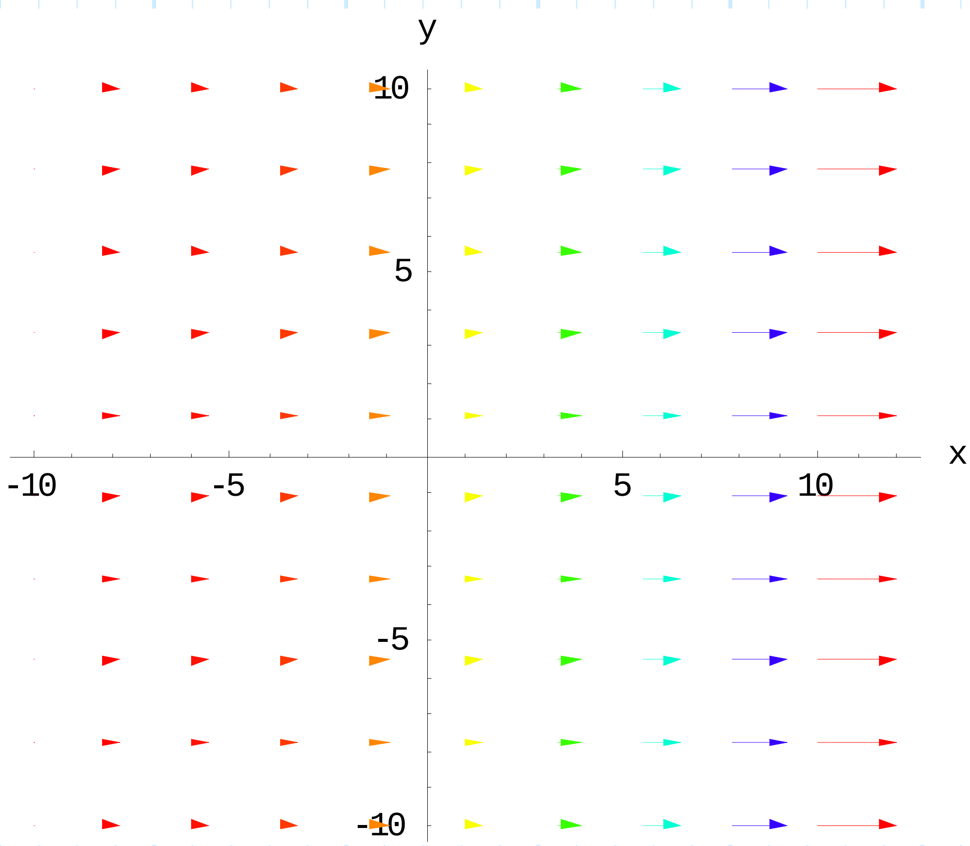
$$\mathbf{A}(\bar{r}) = (10 + x)\hat{\mathbf{a}}_x$$



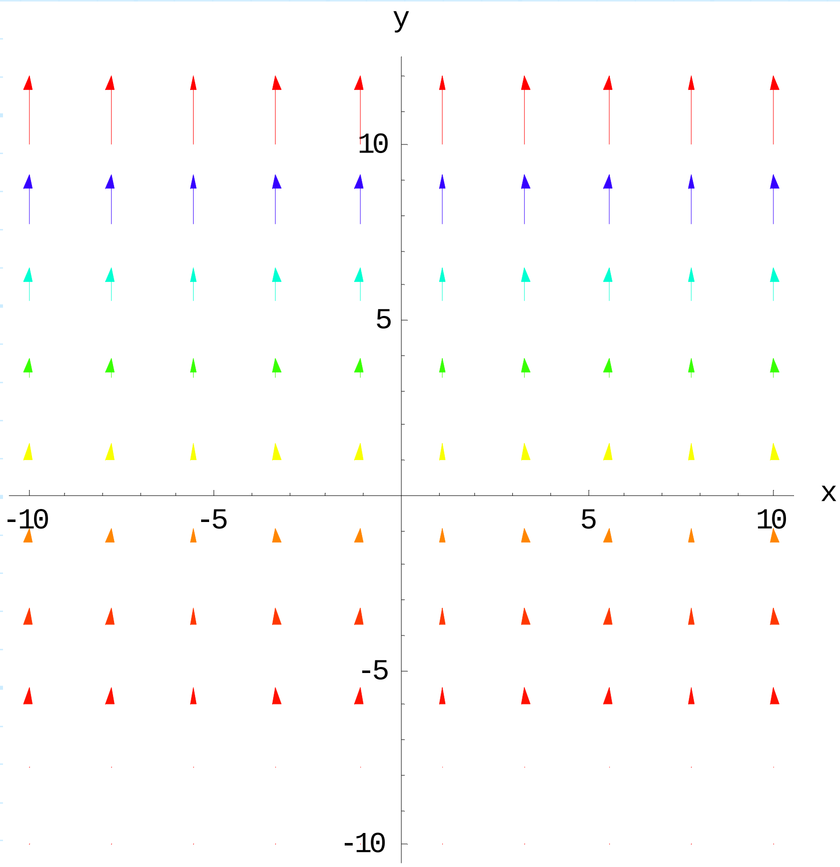
$$\mathbf{A}(\bar{r}) = (10 + x)\hat{\mathbf{a}}_y$$



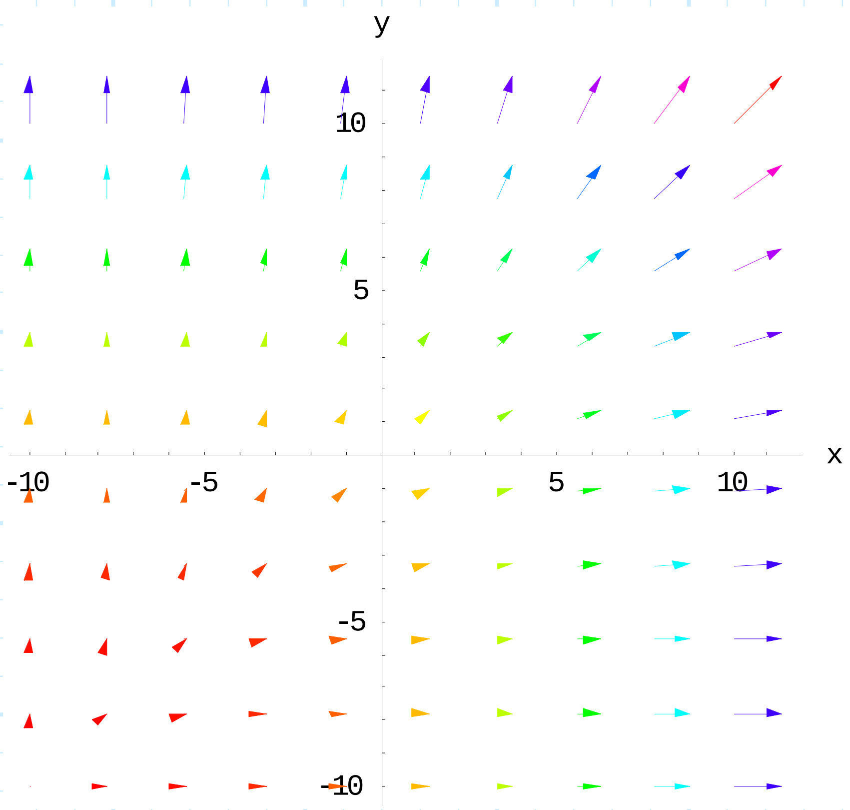
$$\mathbf{A}(\bar{r}) = (10+x)\hat{\mathbf{a}}_x + (10+x)\hat{\mathbf{a}}_y$$



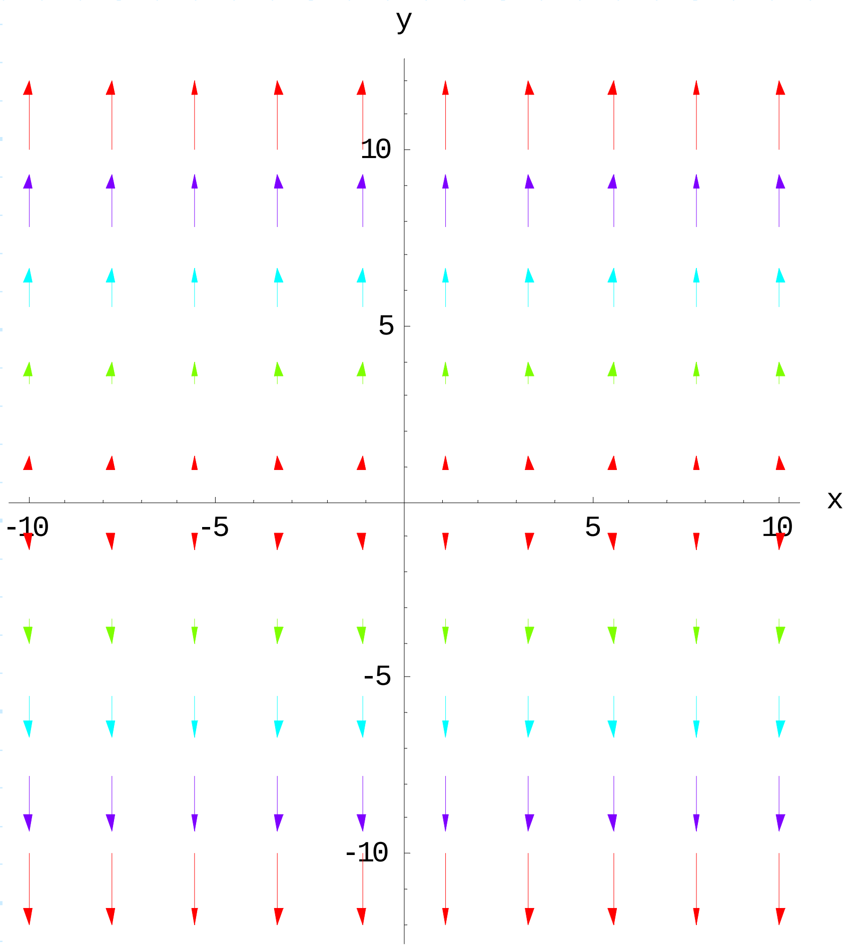
$$\mathbf{A}(\bar{r}) = (10+x)^3\ \hat{\mathbf{a}}_x$$



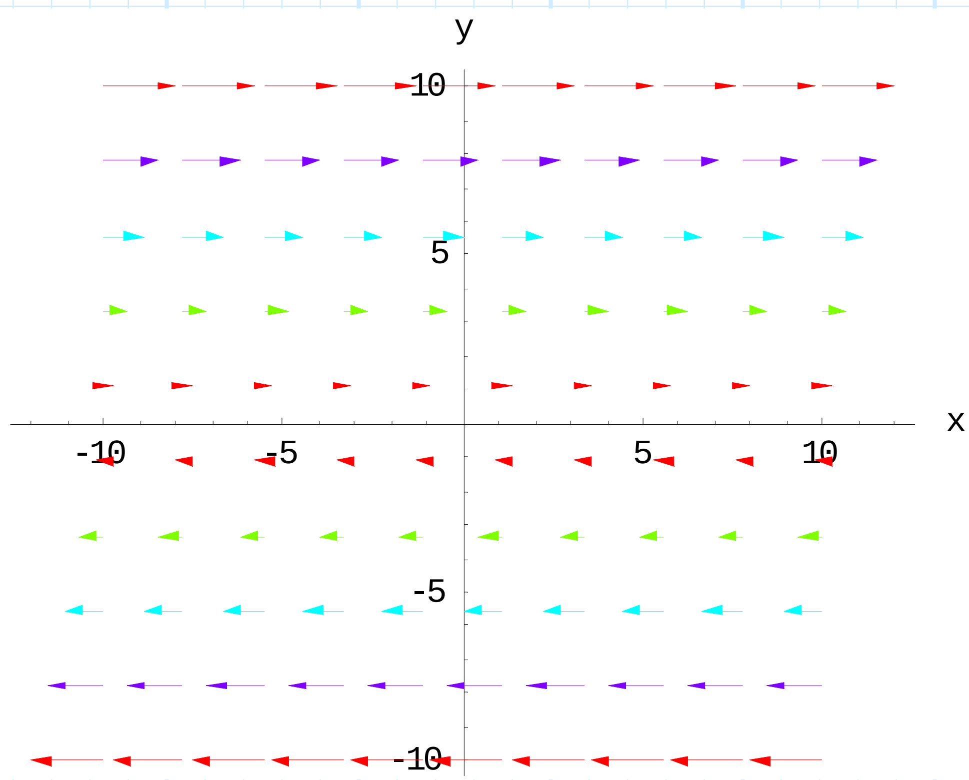
$$\mathbf{A}(\bar{r}) = (10 + y)^3 \ \hat{\mathbf{a}}_y$$



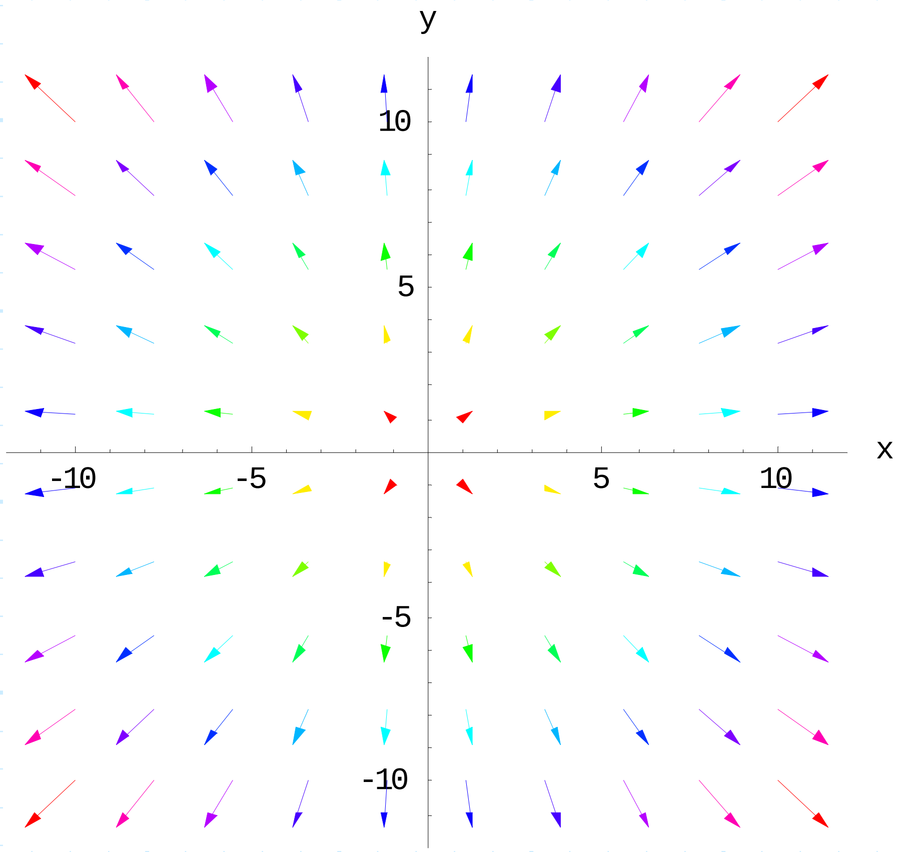
$$\mathbf{A}(\bar{r}) = (10 + x)^3 \ \hat{\mathbf{a}}_x + (10 + y)^3 \ \hat{\mathbf{a}}_y$$



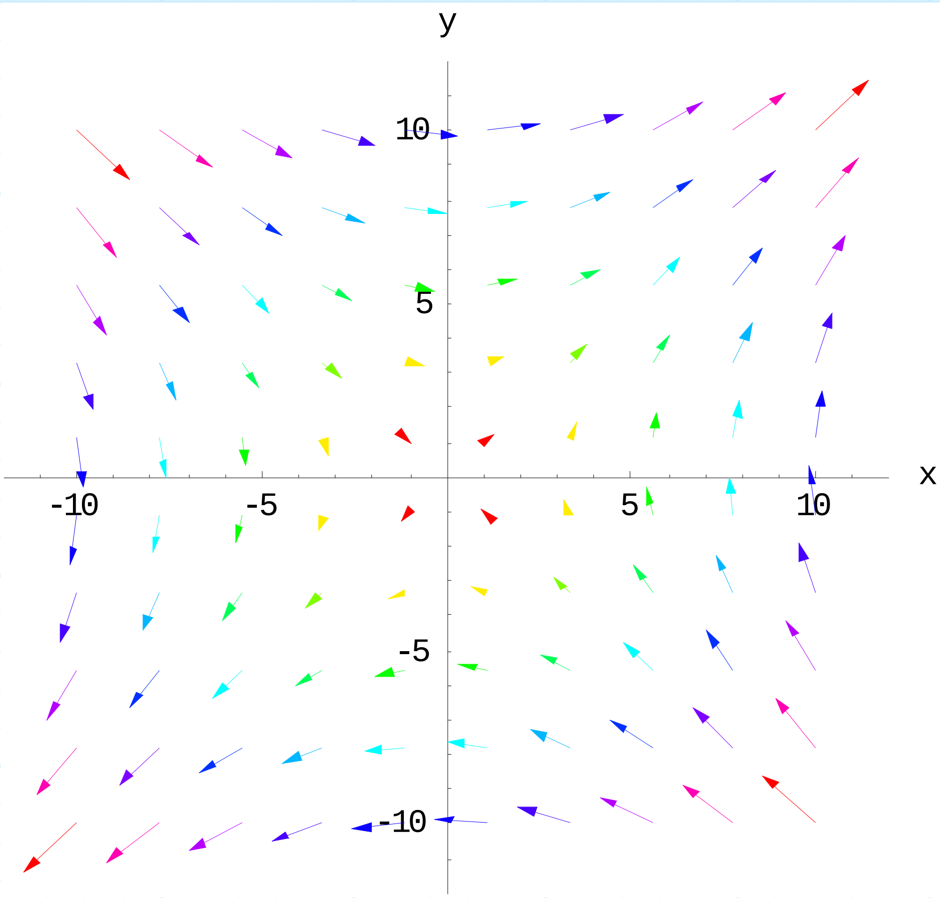
$$\mathbf{A}(\bar{r}) = y\,\hat{\mathbf{a}}_y$$



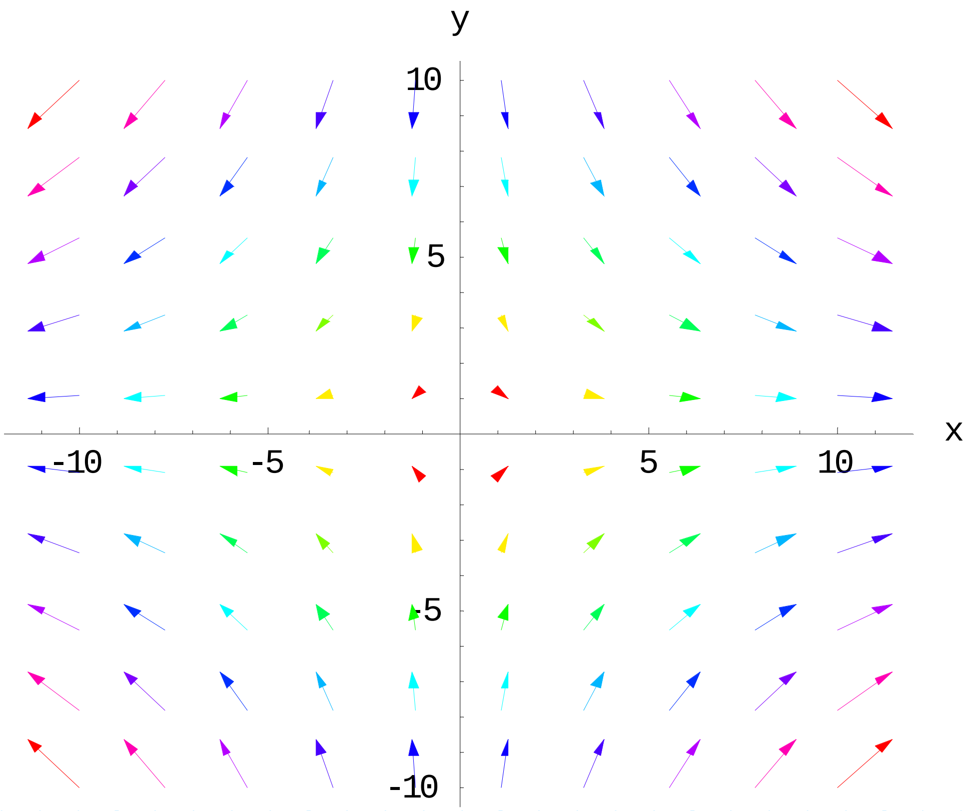
$$\mathbf{A}(\bar{r}) = y\,\hat{\mathbf{a}}_x$$



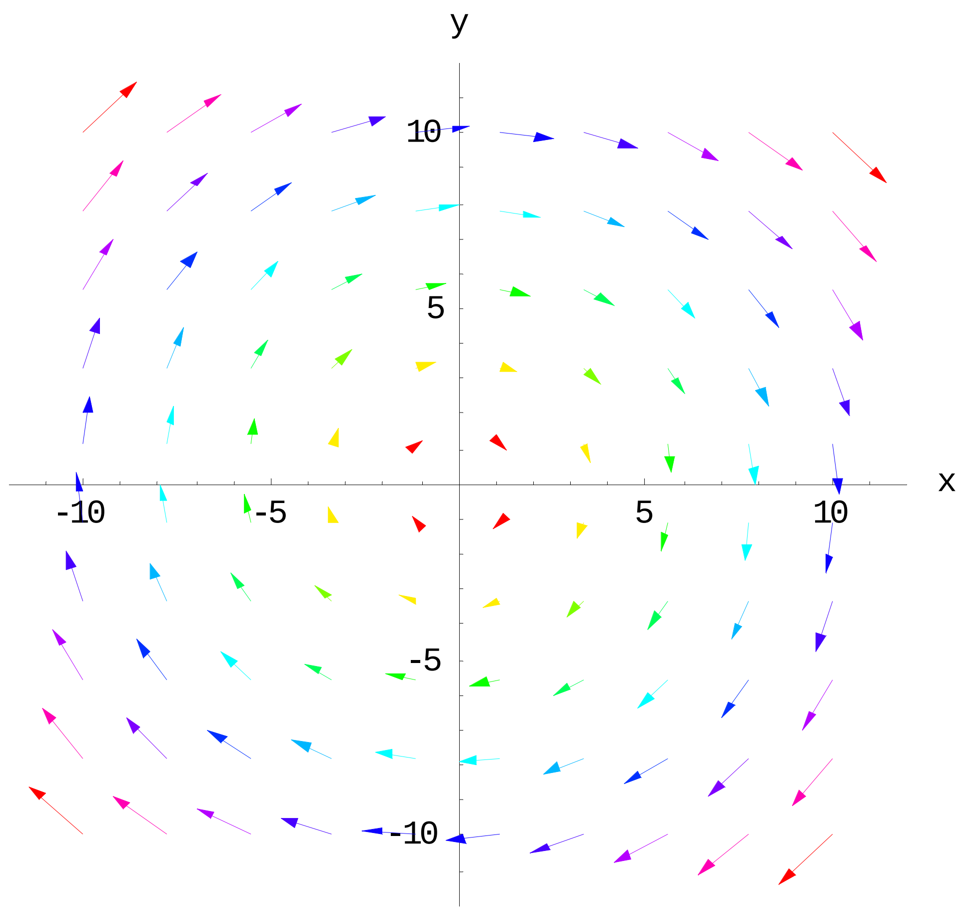
$$\mathbf{A}(\bar{r}) = x\,\hat{a}_x + y\,\hat{a}_y$$



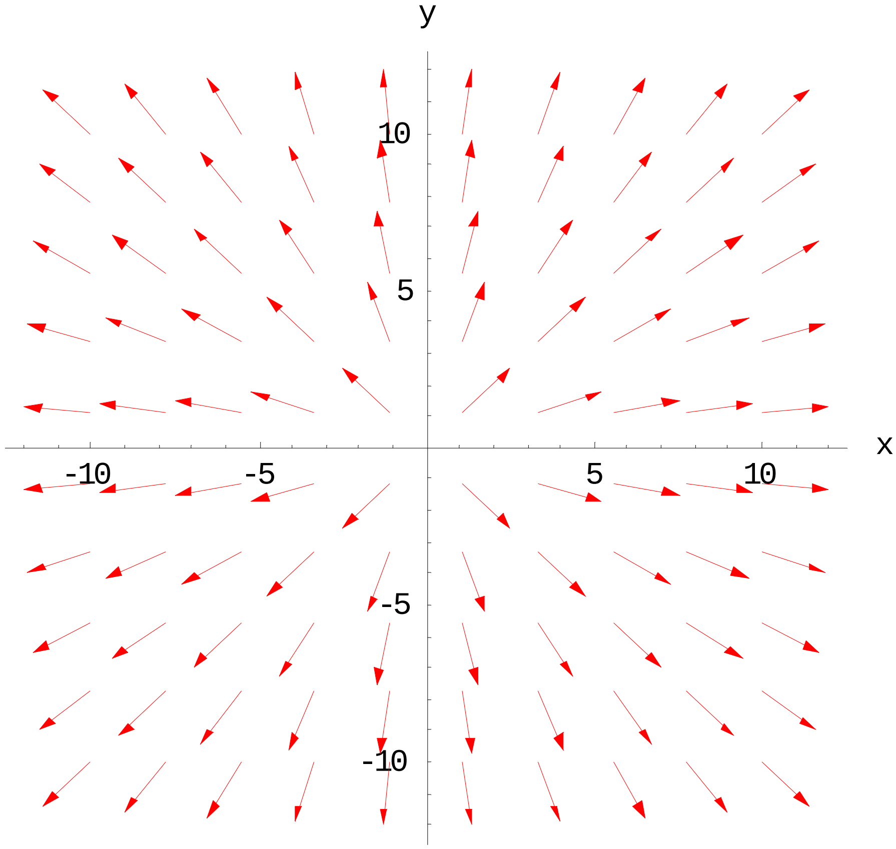
$$\mathbf{A}(\bar{r}) = y\,\hat{a}_x + x\,\hat{a}_y$$



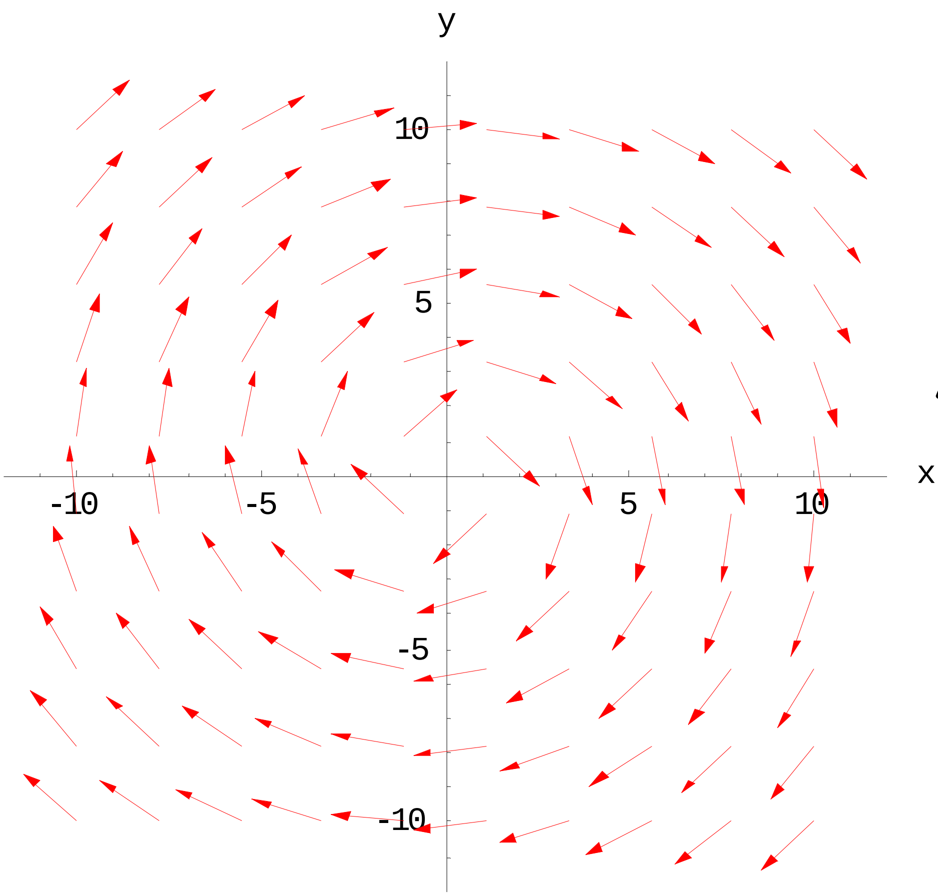
$$\mathbf{A}(\bar{r}) = x\,\hat{\mathbf{a}}_x - y\,\hat{\mathbf{a}}_y$$



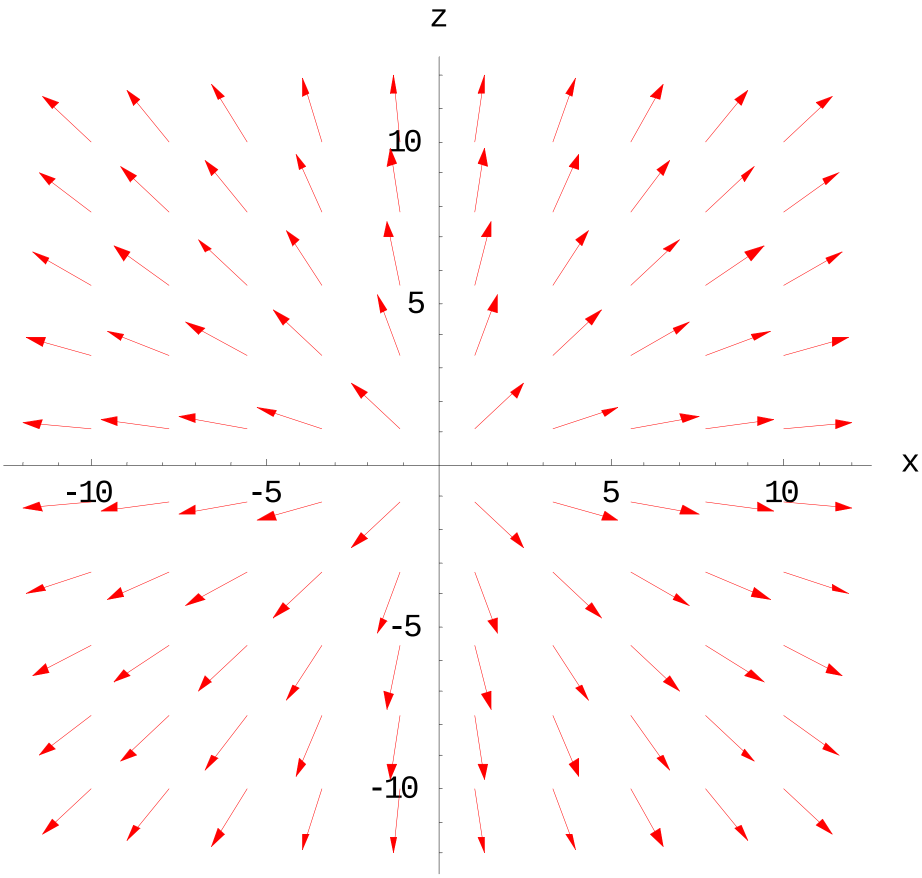
$$\mathbf{A}(\bar{r}) = y\,\hat{\mathbf{a}}_x - x\,\hat{\mathbf{a}}_y$$



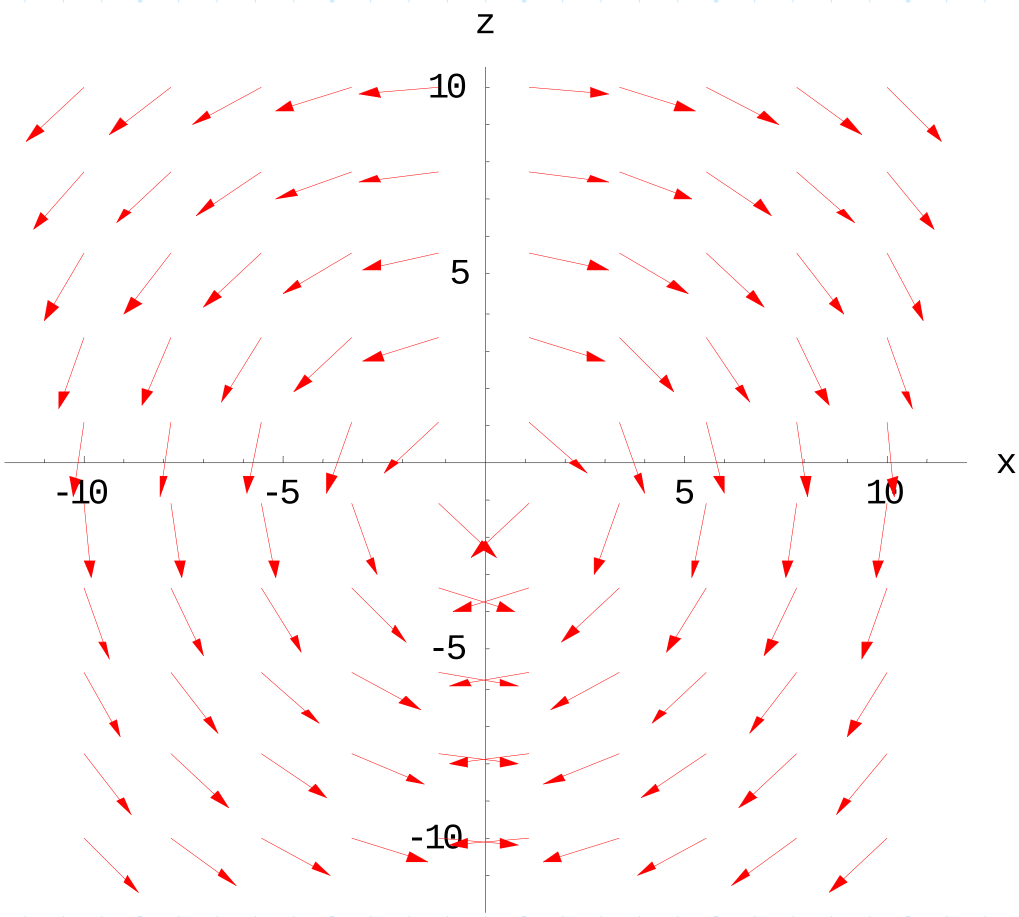
$$\mathbf{A}(\bar{r}) = \hat{\mathbf{a}}_\rho$$
$$= \cos\phi\, \hat{\mathbf{a}}_x + \sin\phi\, \hat{\mathbf{a}}_y$$



$$\mathbf{A}(\bar{r}) = \hat{\mathbf{a}}_\phi$$
$$= \sin\phi\, \hat{\mathbf{a}}_x - \cos\phi\, \hat{\mathbf{a}}_y$$



$$\mathbf{A}(\bar{r}) = \hat{\mathbf{a}}_r$$
$$= \sin\theta\cos\phi\,\hat{\mathbf{a}}_x$$
$$+\cos\theta\,\hat{\mathbf{a}}_y$$



$$\mathbf{A}(\bar{r}) = \hat{\mathbf{a}}_\theta$$
$$= \cos\theta\cos\phi\,\hat{\mathbf{a}}_x$$
$$-\sin\theta\,\hat{\mathbf{a}}_z$$