

31. We use Eq. 25-41:

$$\begin{aligned}E_x(x, y) &= -\frac{\partial V}{\partial x} = -\frac{\partial}{\partial x} \left( (2.0 \text{ V/m}^2)x^2 - (3.0 \text{ V/m}^2)y^2 \right) = -2(2.0 \text{ V/m}^2)x ; \\E_y(x, y) &= -\frac{\partial V}{\partial y} = -\frac{\partial}{\partial y} \left( (2.0 \text{ V/m}^2)x^2 - (3.0 \text{ V/m}^2)y^2 \right) = 2(3.0 \text{ V/m}^2)y .\end{aligned}$$

We evaluate at  $x = 3.0 \text{ m}$  and  $y = 2.0 \text{ m}$  to obtain the magnitude of  $\vec{E}$ :

$$E = \sqrt{E_x^2 + E_y^2} = 17 \text{ V/m} .$$

$\vec{E}$  makes an angle  $\theta$  with the positive  $x$  axis, where

$$\theta = \tan^{-1} \left( \frac{E_y}{E_x} \right) = 135^\circ .$$