**Section 8.3** Slope Fields and Euler's Method

### Slope Fields

Suppose we have a first-order differential equation of the form

$$y' = F(x, y)$$

where $F(x, y)$ is some expression in $x$ and $y$. If we draw short line segments with slope $F(x, y)$ at several points $(x, y)$, the result is called a slope field (or direction field).

### Euler's Method

Euler's method says to start at the point given by the initial condition and proceed in the direction indicated by the direction field. For the general first-order initial-value problem $y' = F(x, y), y(x_0) = y_0$, we use step size $h$ to find the following $y$-values:

$$\begin{aligned} y_1(x_1) &= y(x_0 + h) = y_0 + hF(x_0, y_0) \\ y_2(x_2) &= y(x_1 + h) = y_1 + hF(x_1, y_1) \\ &\vdots \\ y_n(x_n) &= y(x_{n-1} + h) = y_{n-1} + hF(x_{n-1}, y_{n-1}). \end{aligned}$$