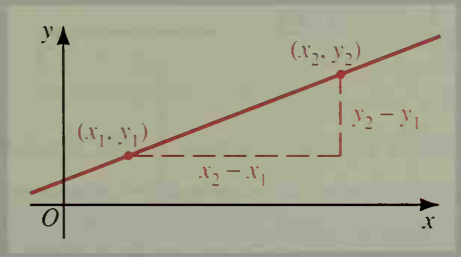
13-2 Slope of a Line

The effect of steepness, or *slope*, must be considered in a variety of everyday situations. Some examples are the grade of a road, the pitch of a roof, the incline of a wheelchair ramp, and the tilt of an unloading platform, such as the one at a paper mill in Maine shown in the photograph at the right. In this section, the informal idea of steepness is generalized and made precise by the mathematical concept of *slope of a line through two points*.

Informally, slope is the ratio of the *change in y* (vertical change) to the *change in x* (horizontal change). The **slope,** denoted by m, of the nonvertical line through the points (x_1, y_1) and (x_2, y_2) is defined as follows:

$$\text{slope } m = \frac{y_2 - y_1}{x_2 - x_1}$$

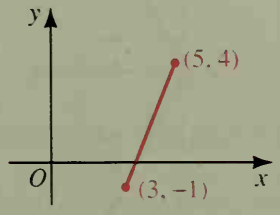
$$= \frac{\text{change in } y}{\text{change in } x}$$



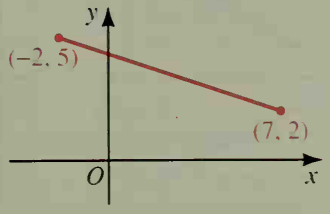
When you are given several points on a line you can use any two of them to compute the slope. Furthermore, the slope of a line does not depend on the order in which the points are chosen because $\frac{y_2 - y_1}{x_2 - x_1} = \frac{y_1 - y_2}{x_1 - x_2}$.

Example 1 Find the slope of each segment.

a.



b.



Solution **a.** $\frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - (-1)}{5 - 3} = \frac{5}{2}$ **b.** $\frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 5}{7 - (-2)} = \frac{-3}{9} = -\frac{1}{3}$