

1. A point is moving along the graph of the given function such that  $\frac{dx}{dt}$  is 2 centimeters per second.

Find  $\frac{dy}{dt}$  for the given value of  $x$ :

a)  $y = x^2 + 1$        $x = -1$

b)  $y = \frac{1}{1+x^2}$        $x = 2$

2. Suppose  $x$  and  $y$  are both differentiable functions of  $t$  and are related by the equation  $y = x^2 + 3$ . Find  $\frac{dy}{dt}$  when  $x = 1$  given that  $\frac{dx}{dt} = 2$ .

3. If  $x^2 + 3xy + y^2 = 1$  and  $\frac{dy}{dt} = 2$ , find  $\frac{dx}{dt}$  when  $y = 1$ .

4. If  $V = \frac{4}{3}\pi r^3$ , find  $\frac{dV}{dt}$  when  $r = 3$ , given that  $\frac{dr}{dt} = 1$ .

5. A poster is to contain 100 square inches of picture surrounded by a 4-inch margin at the top and bottom and a 2-inch margin on each side. Find the overall dimensions that will minimize the total area of the poster.