2.7 Related rates

Assume that both $x$ and $y$ are functions of time $t$, that is, $x = \quad$ and $y = \quad$.

Then
\[
\frac{dx}{dt} =
\quad
\frac{dy}{dt} =
\]

EXAMPLES

1. A point is moving along the graph of $y = \sin x$ at a rate of $\frac{dx}{dt} = 2 \text{ cm/sec}$. Find $\frac{dy}{dt}$ at $x = \pi/6$, $\pi/4$, and $\pi/2$.

2. A plane flying horizontally at an altitude of 1 mile and a speed of 500 mi/hr passes directly over a radar station. Find the rate at which the distance from the plane to the station is increasing when it is 2 miles away from the station.
3. A street light is mounted at the top of a 15 ft tall pole. A man 6 ft tall walks away from the pole with a speed of 5 ft/sec along a straight path. How fast is the length of his shadow increasing when he is 40 ft from the pole?

4. A trough is 10 ft long and its ends have the shape of isosceles triangles that are 3 ft across at the top and have a height of 1 ft. If the trough is being filled with water at a rate of 12 ft³/min, how fast is the water level rising when the water is 6 inches deep?

5. A plane flying with constant speed of 300 km/hr passes over a ground radar station at an altitude of 1 km and climbs at an angle of 30°. At what rate is the distance from the plane to the radar station increasing a minute later?