

2.7: Related Rates

Steps to solving a related rate problem

- 1) Draw a picture of the physical situation. Write down the given rates and values.*
- 2) Write an equation that relates the quantities of interest.*
- 3) Take the derivative with respect to time of both sides of the equation.*
- 4) Solve for the quantity needed.*

1) Find the derivative with respect to time.

$$x^2 + y^2 - 2y - 4x = 0$$

2) Air is being pumped into a spherical balloon at a rate of $5 \text{ cm}^3/\text{min}$. Find the rate of change of the radius when the diameter of the balloon is 20 cm.

3)) A circle's area is increasing at a rate of $5 \text{ in}^2/\text{min}$. At what rate is the radius increasing when the circumference is 40 in .

4) The altitude of a triangle is increasing at a rate of $1\text{cm}/\text{min}$ while the area of the triangle is increasing at a rate of $2\text{cm}^2/\text{min}$. At what rate is the base of the triangle changing when the altitude is 10cm and the area is 100cm^2 .

- 5) A 5 foot ladder is leaning against the side of a house when its base starts to slide away. By the time the base is 3 feet from the house, the base is moving at a rate of $\frac{1}{4}$ ft/sec. How fast is the top of the ladder sliding down the wall at that moment?

6) Two cars start at the same point. One travels south at 60km/h and the other travels west at 25km/h. At what rate is the distance between them increasing two hours later?