RELATED RATES

DIFFERENTIAL CALCULUS

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TOPIC OUTLINE

Related Rates Problem Solving

RELATED RATES PROBLEM SOLVING
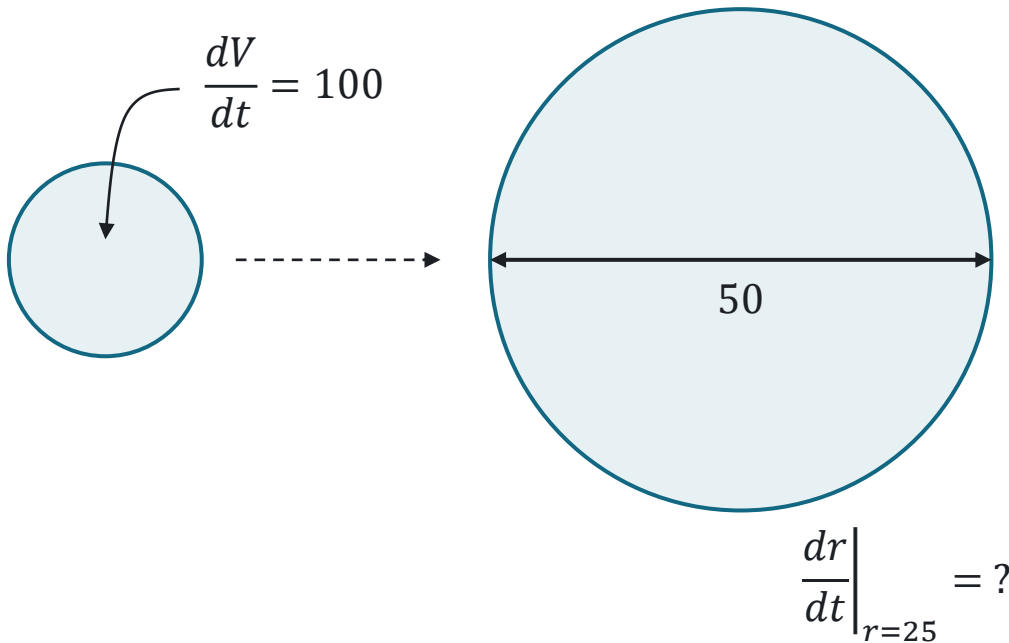
EXERCISE

Air is being pumped into a spherical ballon so that its volume increases at a rate of $100\ cm^3/s$. How fast is the radius of the ballon increasing when the diameter is $50\ cm$?

Solution

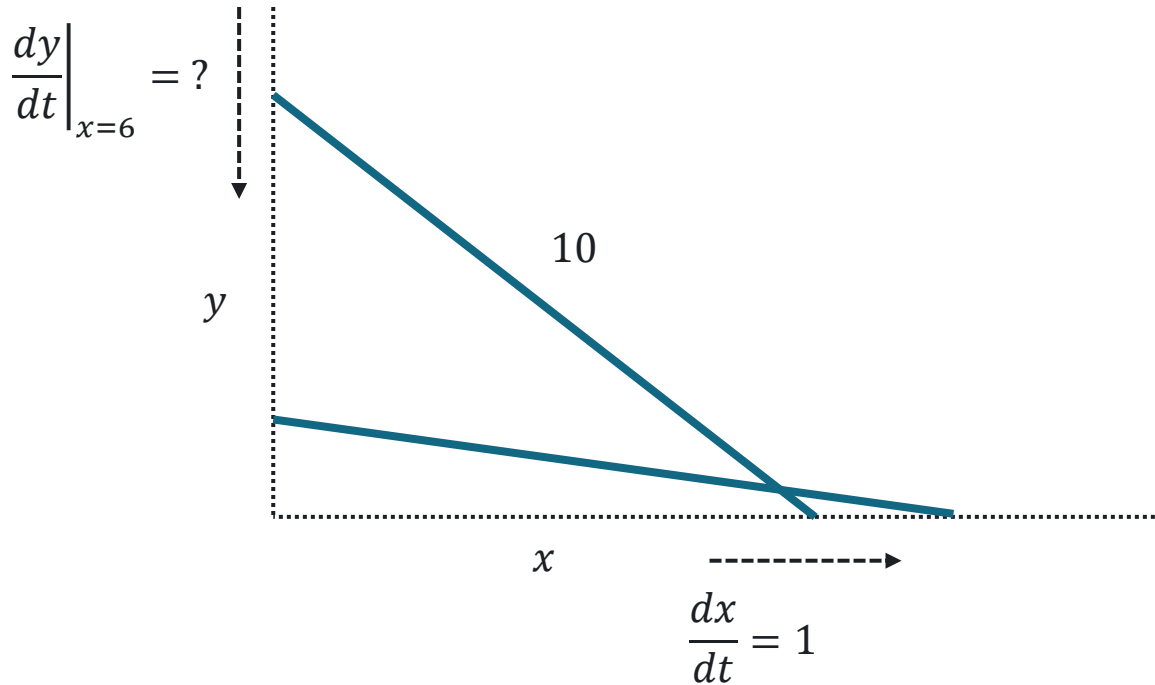$$\frac{dV}{dt} = 100$$

50

$$\left.\frac{dr}{dt}\right|_{r=25} = ?$$

EXERCISE

A ladder 10 ft long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 1 ft/s, how fast is the top of the ladder sliding down the wall when the bottom of the ladder is 6 ft from the wall?
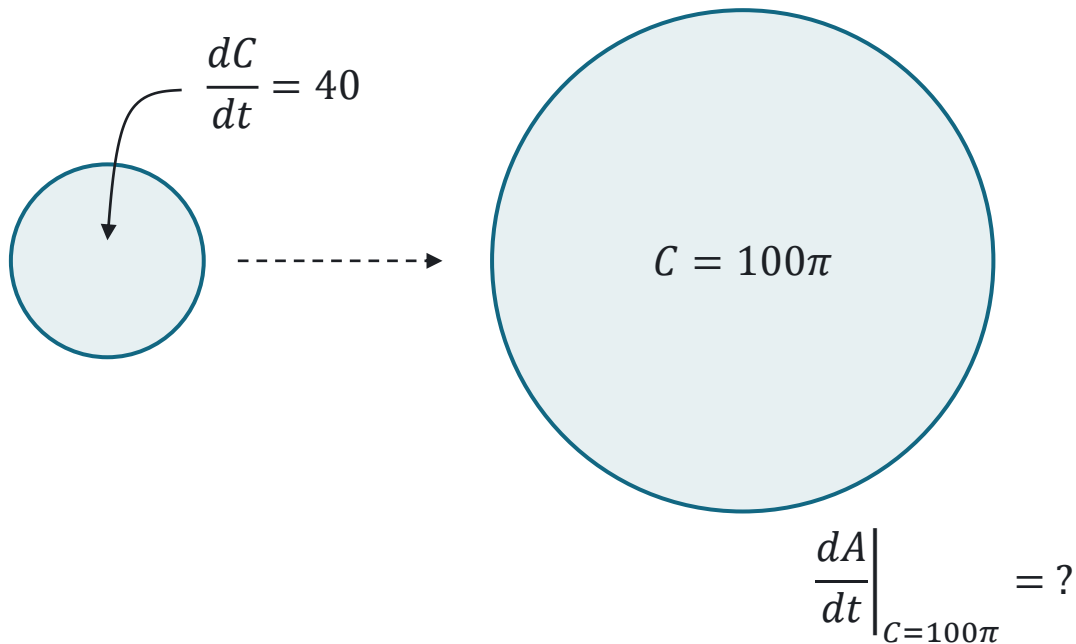
Solution

$\left.\dfrac{dy}{dt}\right|_{x=6} = ?$

10

y

x

$\dfrac{dx}{dt} = 1$

EXERCISE

Oil spilled from a tanker spreads in a circle whose circumference increases at a rate of $40\ ft/s$. How fast is the area of the spill increasing when the circumference of the circle is $100\pi\ ft$?
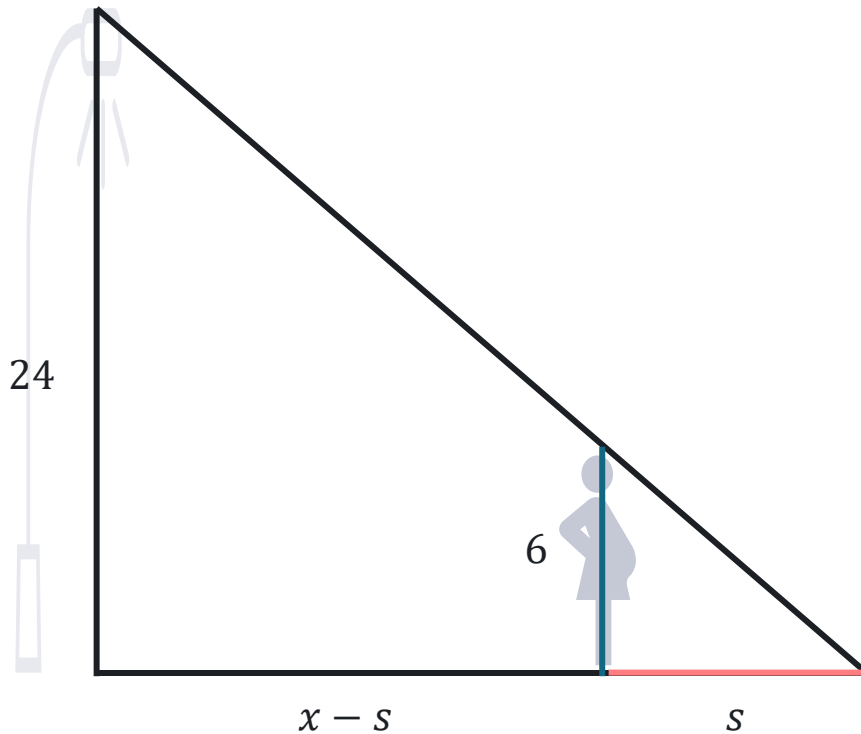
Solution

$$\frac{dC}{dt} = 40$$

$$C = 100\pi$$

$$\left.\frac{dA}{dt}\right|_{C=100\pi} = ?$$

EXERCISE

A 6-ft tall woman is walking at the rate of $4\ ft/s$ away from a streetlamp that is $24\ ft$ tall. How fast is the length of her shadow changing?

Solution

24

6

$x - s$

s

EXERCISE

The voltage V, in electrical circuit is related to the current I, and the resistance R, by the equation $V = IR$. The current is decreasing at $-4\ amps/sec$ as the resistance increases at $20\ ohms/sec$. How fast is the voltage changing when the voltage is $100\ volts$ and the current is $20\ amps$?

Solution

EXERCISE

If a snowball melts so that its surface area decreases at a rate of 1 cm^2/min, find the rate at which the diameter decreases when the diameter is 10 cm.

Solution

EXERCISE

On a rainy day, a girl broke up with her boyfriend after being together for eight long years. They decided to separate at the place where everything about them began, at the same time. The boy is due north crying and running at a rate of 5 ft/s and the girl is walking due east at the rate of 1 ft/s thinking if she made the right decision. How fast are they separating from each other 2 seconds after they started moving to a new life without each other?

Solution

LABORATORY