

**Q 1.** Find the derivative of  $y$  with respect to given independent variable.

a)  $y = \ln(2\pi^{-x} \sin x)$

b)  $y = \log_2(\operatorname{arccsc} \sqrt{t})$

c)  $y = \cot^{-1} \frac{1}{x} - \tan^{-1} x$

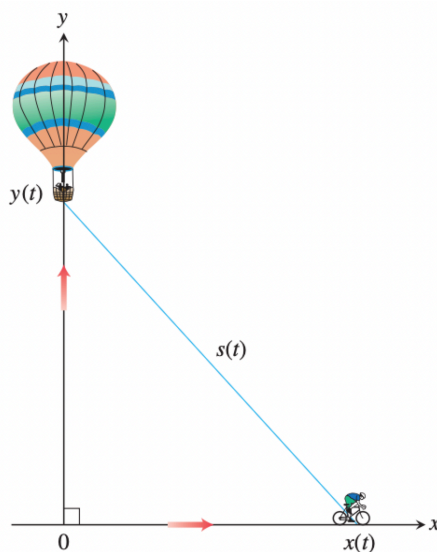
**Q 2.** Find  $\frac{dy}{dx}$  for the following exercises.

a)  $x^y = y^x$

b)  $y = x^{\sin x}$

**Q 3.** Determine how fast the length of an edge of a cube is changing at the moment when the length of the edge is 5 cm and the volume of the cube is decreasing at rate of  $100 \text{ cm}^3/\text{sec}$ .

**Q 4.** A balloon is rising vertically above a level, straight road at a constant rate of  $0.3 \text{ m/s}$ . Just when the balloon is 20 m above the ground, a bicycle moving at a constant rate of  $5 \text{ m/s}$  passes under it. How fast is the distance  $s(t)$  between the bicycle and balloon increasing 3 s later?



**Q 5.** Find the linearization of

$$f(x) = \sqrt{1+x} + \sin x - 0.5$$

at  $x = 0$ . Then, find  $f(0.01)$  approximately.

**Q 6.** *The diameter of a tree was 25 cm. During the following year, the circumference increased 5 cm. About how much did the tree's diameter increase? What is the tree's cross-sectional area?*

**Q 7.** *Determine all critical points and all domain end-points of the function*

$$y = 2\sqrt{1 - x^2} + \arcsin x.$$

**Q 8.** *Find the absolute maximum and minimum values of the function*

$$f(x) = \begin{cases} x^2 - 6x + 18, & x \geq 1 \\ x^2 + 12 & x < 1 \end{cases}$$

on  $\left[\frac{-1}{2}, 4\right]$ .