

October 2

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1. Find  $\frac{dy}{dx}$  using implicit differentiation

(a)  $\sin(xy) = x + y$

(b)  $\cos(y^2) + x = e^y$

(c)  $y = \frac{x+1}{y-1}$

2. Find the slope at the given point.

(a)  $\sqrt[3]{x} + \sqrt[3]{y^4} = 2; (1, 1)$

(b)  $(x + y)^{2/3} = y; (4, 4)$

3. Find the equations of each tangent line for  $x = 1$  for the following curve

$$x + y^3 - y = 1$$

4. (a) At what point does  $x + y^3 - y = 1$  have a vertical tangent line? (b) Does it have any horizontal tangent lines?

5. If you slice a sphere the small piece is a spherical cap. Its volume is given by

$$V = \frac{1}{3}\pi h^2(3r - h)$$

where  $r$  is the radius of the sphere and  $h$  is the cap thickness.(a) Find  $\frac{dr}{dh}$  for a spherical cap of volume  $\frac{5\pi}{3}$ .(b) Evaluate the derivative  $\frac{dr}{dh}$  when  $r = 2$  and  $h = 1$ .