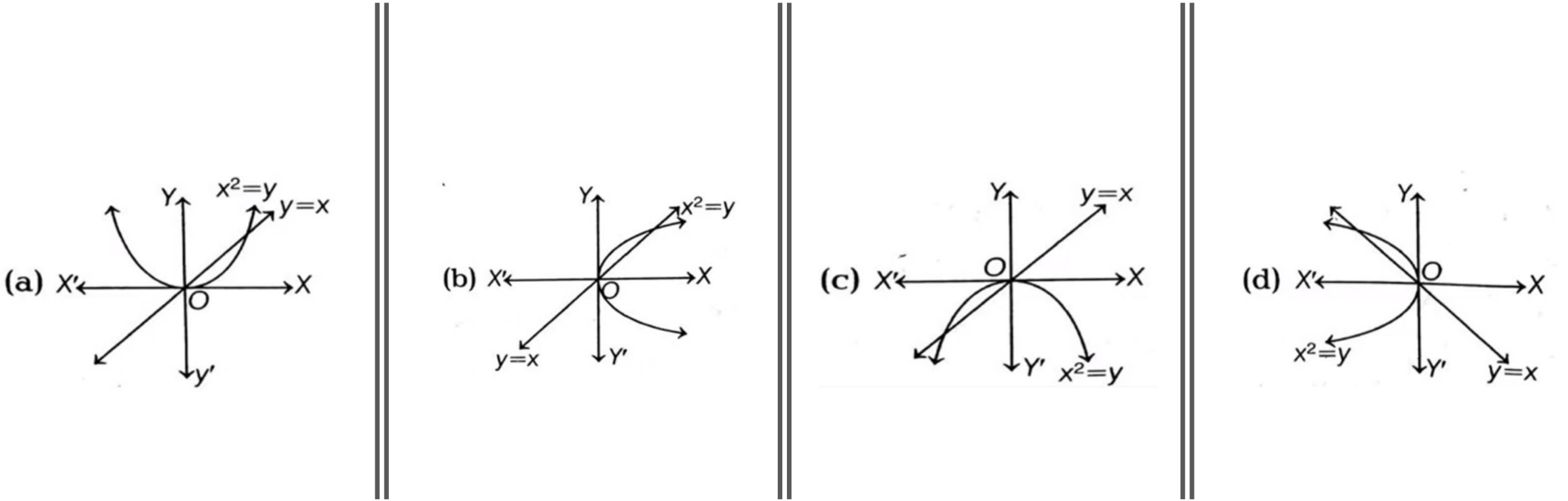
Mathematics Case Based Question Practice Problem

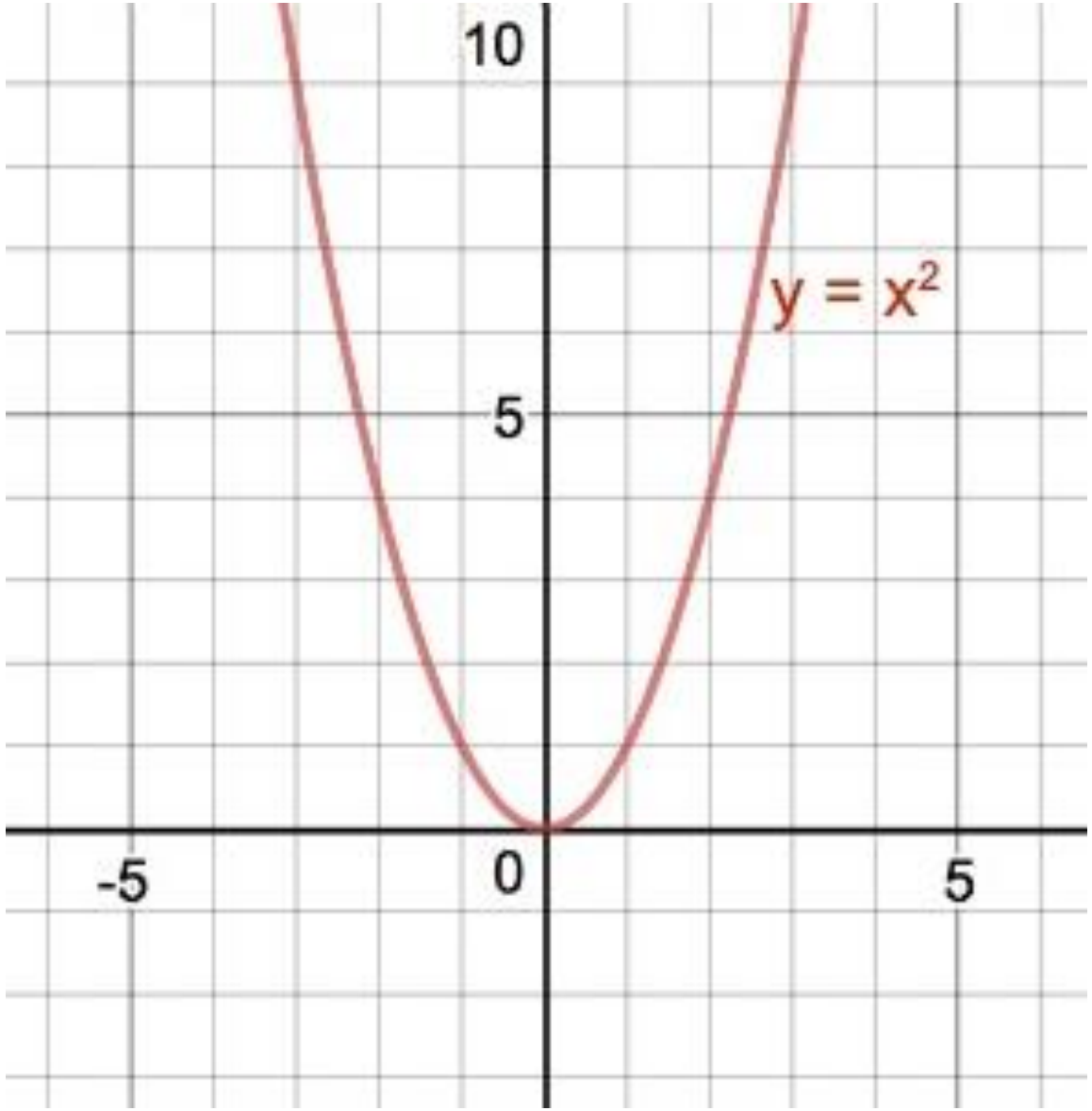
Solution and Explanation by Krishnaraj and Sahil.



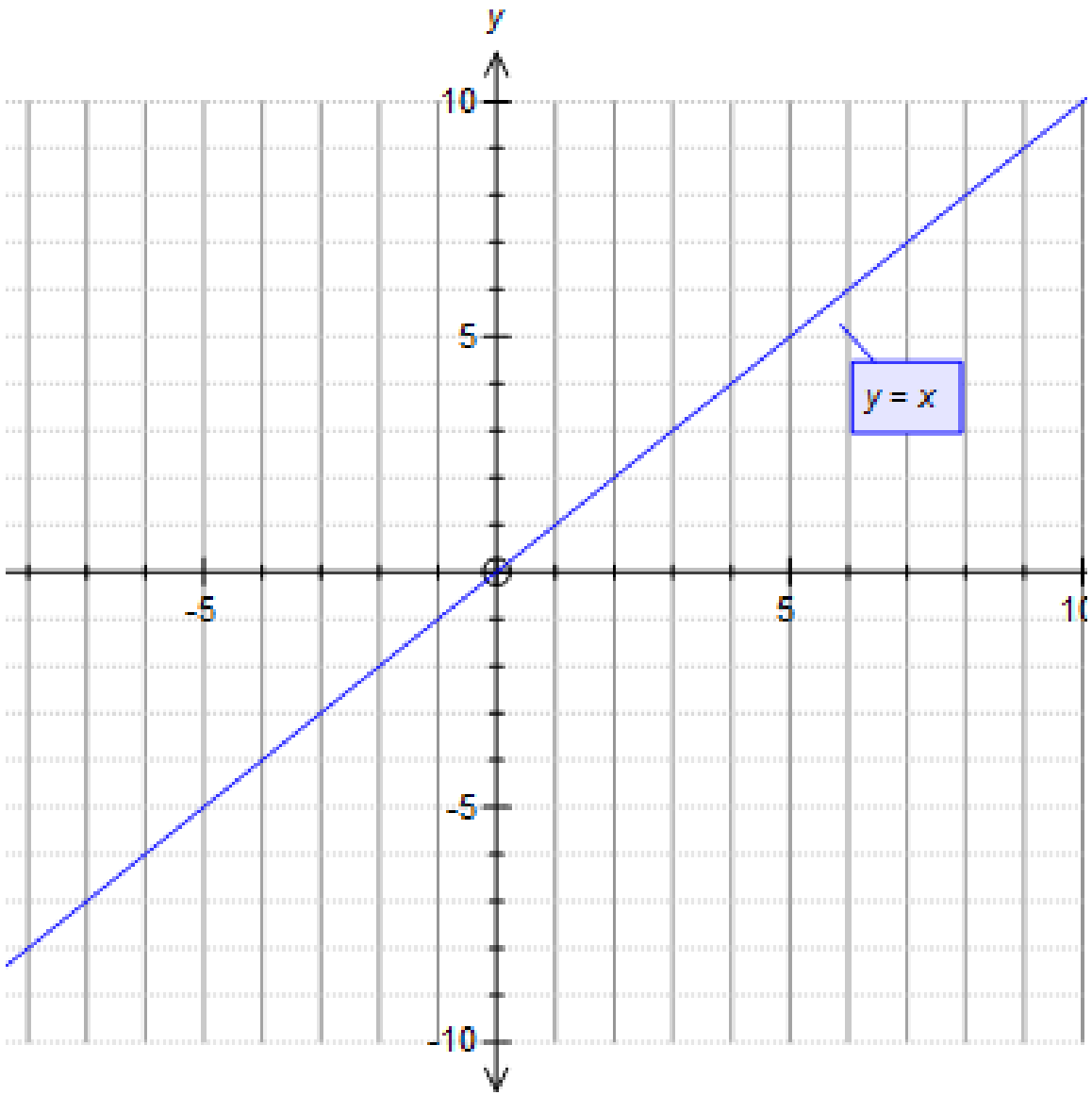
Consider the following equations of curve x^2 = y and y = x. Based on the above information, answer the following questions.

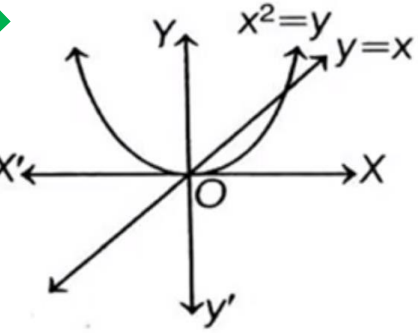
1. What is the graph of the 2 given curves among the above?

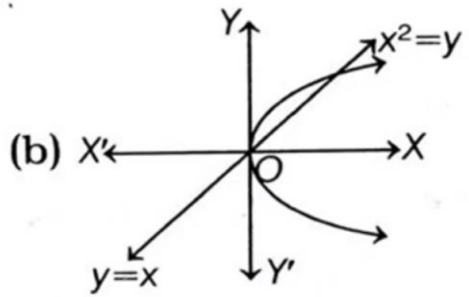
Graph of y=x^2

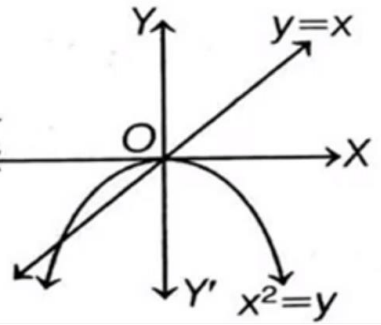


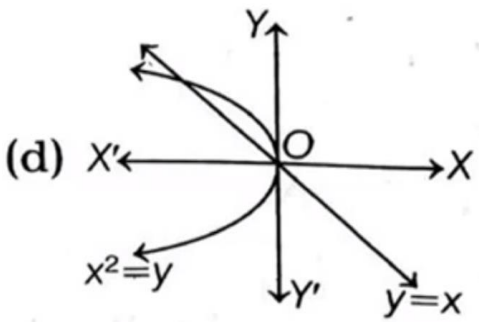
Graph of y = x



(a) 

(b) 

(c) 

(d) 

Which is the graph of the given curves?

Question on Application of Derivatives

2. The point of intersection of both the curves is

a. (0, 0), (2, 2)
b. (0, 0), (1, 1)
c. (0, 0), (-1, -1)
d. (0, 0), (-2, -2)

Solution

To find the common points, Let us equate the given equations.
y = x^2
y = x
So
x = x^2
x = 1
When x = 1,
y = 1^2 = 1
So the point of intersection is
(0, 0), (1, 1)

Therefore,

2. Consider the following equations of curve x^2 = y and y = x. Based on the above information, answer the following questions.

i. The point of intersection of both the curves is

a. (0, 0), (1, 1)
b. (0, 0), (2, 2)
c. (0, 0), (-1, -1)
d. (0, 0), (-2, -2)

(iii) The value of integral $\int_0^1 x\,dx$ is

(a) $\frac{1}{4}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) 1

$$\int_0^1 x\,\mathrm{d}x = \left[\frac{x^2}{2}\right]_0^1$$

$$\frac{1}{2} - \frac{0}{2} = \frac{1}{2}$$

(c)

(iv) The value of integral $\int_0^1 x^2\, dx$ is

(a) $\frac{1}{4}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) 1

$$\int_0^1 x^2\, \mathrm{d}x = \frac{x^3}{3}$$

$$\frac{1^3}{3} - \frac{0}{3}$$

$$= \frac{1}{3}$$

(v) The value of area bounded by the curves $x^2 = y$ and $y = x$ is (in sq unit)

(a) $\frac{1}{6}$ (b) $\frac{1}{4}$ (c) $\frac{1}{3}$ (d) $\frac{1}{2}$

$$\int_0^1 x\,dx = \left[\frac{x^2}{2}\right]_0^1 - \int_0^1 x^2\,dx = \frac{x^3}{3}$$

$$\frac{1}{2} - \frac{0}{2} = \frac{1}{2} - \left(\frac{1^3}{3} - \frac{0}{3}\right)$$

$$\frac{1}{2} - \frac{1}{3} = \frac{3-2}{6} = \frac{1}{6}$$

Thank You!