For the primitive integral equation $ydx + y^2dy = x\,dy$; $x \in R, y > 0, y = y(x), y(1) = 1$, then $y(-3)$ is *(2005S)*

(a) 3 (b) 2 (c) 1 (d) 5

(a) The given eq^n is

$$ydx + y^2 dy = x\,dy \;; x \in R, y > 0, y(1) = 1$$

$$\Rightarrow \quad \frac{ydx - xdy}{y^2} + dy = 0 \;\Rightarrow\; \frac{d}{dx}\left(\frac{x}{y}\right) + dy = 0$$

On integration, we get $\frac{x}{y} + y = C$

$$y(1) = 1 \;\Rightarrow\; 1 + 1 = C \;\Rightarrow\; C = 2$$

$$\therefore \quad \frac{x}{y} + y = 2$$

Now to find $y(-3)$, putting $x = -3$ in above eq^n, we get

$$-\frac{3}{y} + y = 2 \;\Rightarrow\; y^2 - 2y - 3 = 0 \;\Rightarrow\; y = 3, -1$$

But given that $y > 0$, $\quad \therefore \quad y = 3$