

Problem Statement 2

$$y_1 = 2x + 1$$

↑ ①

$$y_2 = \frac{2x}{1 + 0.2x}$$

↑ ②

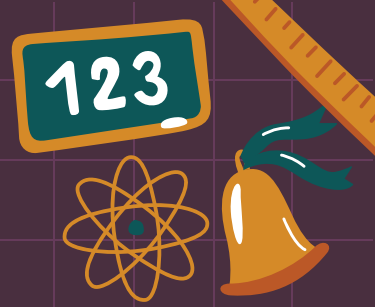
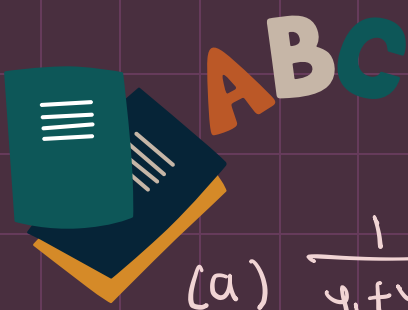
- * The problem asks to calculate integral I_1 & I_2 wrt dy_1 .
- * Therefore first evaluate $\left(\frac{1}{y_1 + y_2}\right)$ and $\left(\frac{1}{y_1 - y_2}\right)$ in terms of y_1 and then integrate the result.
- * for $\left(\frac{1}{y_1 + y_2}\right)$; the sum came to be unbounded from 0 to 15.

$$\text{from ①} \Rightarrow x = \frac{y_1 - 1}{2} \quad \text{--- ③}$$

Use value of x from ③ in ②

$$\therefore y_2 = \frac{2\left(\frac{y_1 - 1}{2}\right)}{1 + \frac{2}{10}\left[\frac{y_1 - 1}{2}\right]} = \frac{y_1 - 1}{1 + \frac{y_1 - 1}{10}} = \frac{10y_1 - 10}{y_1 + 9}$$





$$(a) \frac{1}{y_1 + y_2} = \frac{1}{y_1 + \left[\frac{10(y_1 - 1)}{y_1 + 9} \right]}$$

$$\frac{1}{y_1 + y_2} = \frac{y_1 + 9}{y_1^2 + 19y_1 - 10}$$

$$(b) \therefore \frac{1}{y_1 - y_2} = \frac{1}{y_1 - \left[\frac{10(y_1 - 1)}{y_1 + 9} \right]}$$

$$\frac{1}{y_1 - y_2} = \frac{y_1 + 9}{y_1^2 - y_1 + 10}$$

Now solving $I_1 = \int_0^{15} \frac{1}{y_1 + y_2} dy$ is challenging as

integral do not exists among the given bounds,
due to its pole nature near $x=0.6$.

i.e. I_1 is not bounded in the
given limits.

