

9-9.2-29

EE24BTECH11064 - Harshil Rathan

Question:

Using integration, find the area of the region bounded by the line $2y = 3x + 12$, x-axis and the lines $x = 2$ and $x = 8$.

Solution:

Equations	Given
$2y$	$3x + 12$
x	$2, 8$

TABLE 0: Given Equations

$$y = \frac{3}{2}x + 6 \quad (0.1)$$

Calculate area between line and $x = 2$ and $x = 8$

$$\text{Area} = \int_2^8 \left(\frac{3}{2}x + 6 \right) dx \quad (0.2)$$

$$\int \left(\frac{3}{2}x + 6 \right) dx = \frac{3}{2} \cdot \frac{x^2}{2} + 6x = \frac{3}{4}x^2 + 6x \quad (0.3)$$

$$\int_2^8 \left(\frac{3}{2}x + 6 \right) dx = \left[\frac{3}{4}x^2 + 6x \right]_2^8 \quad (0.4)$$

First, we calculate the upper limit at $x = 8$

$$\frac{3}{4}(8^2) + 6(8) = \frac{3}{4}(64) + 48 = 48 + 48 = 96.4 \quad (0.5)$$

Calculate the lower limit at $x = 2$

$$\frac{3}{4}(2^2) + 6(2) = \frac{3}{4}(4) + 12 = 3 + 12 = 15.4 \quad (0.6)$$

Subtract the lower limit from the upper limit

$$\text{Area} = 96 - 15 = 81.0 \quad (0.7)$$

The Area between $2y = 3x + 12$ and $x = 2$, $x = 8$ is 81 units

(0, 6)

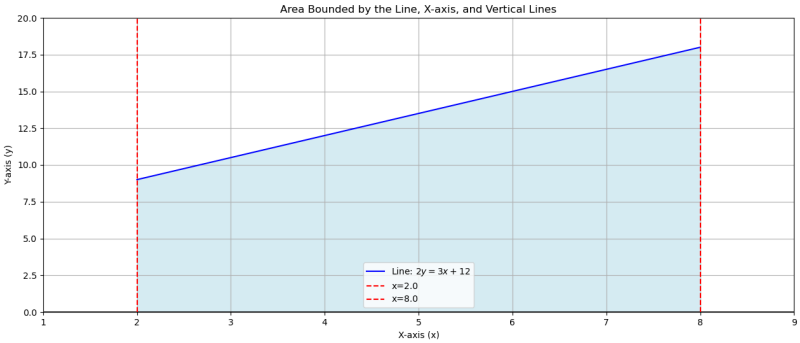


Fig. 0.1