

MA 16010 LESSON 34: NUMERICAL INTEGRATION (Examples)

EX 1: Use the Trapezoid Rule to approximate $\int_0^3 x^2 dx$ using $n = 3$. Round your answer to the nearest tenth.

Solution: (1) First calculate Δx .

$$a = \underline{\hspace{2cm}}$$

$$b = \underline{\hspace{2cm}}$$

$$b - a = \underline{\hspace{2cm}}$$

$$\Delta x = \frac{b - a}{n} = \underline{\hspace{2cm}}$$

(2) Determine what $f(x)$ is.

$$\int_0^3 \boxed{x^2} dx$$

Hence $f(x) = \underline{\hspace{2cm}}$

(3) Find the following values:

$$x_0 = \underline{\hspace{2cm}}$$

$$f(x_0) = \underline{\hspace{2cm}}$$

$$x_1 = \underline{\hspace{2cm}}$$

$$f(x_1) = \underline{\hspace{2cm}}$$

$$x_2 = \underline{\hspace{2cm}}$$

$$f(x_2) = \underline{\hspace{2cm}}$$

$$x_3 = \underline{\hspace{2cm}}$$

$$f(x_3) = \underline{\hspace{2cm}}$$

$$f(x_0) = \underline{\hspace{2cm}}$$

$$2 \cdot f(x_1) = \underline{\hspace{2cm}}$$

$$2 \cdot f(x_2) = \underline{\hspace{2cm}}$$

$$f(x_3) = \underline{\hspace{2cm}}$$

(4) Sum all the values in the black box. $= \underline{\hspace{2cm}}$

(5) Multiply the value found in (4), Δx found in (1), and $1/2$, which yields our answer.

$\underline{\hspace{10cm}}$

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EX 2: Approximate the area of the shaded region by using the Trapezoid Rule with $n = 3$

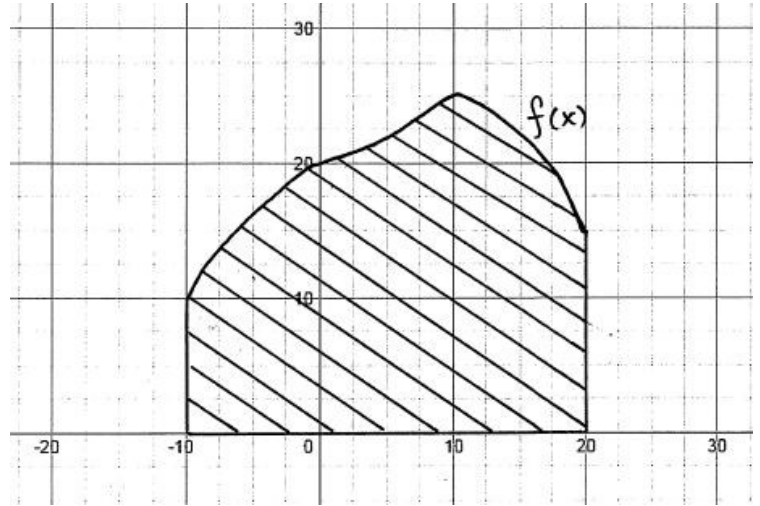
Solution: (1) First calculate Δx .

$$a = \underline{\hspace{2cm}}$$

$$b = \underline{\hspace{2cm}}$$

$$b - a = \underline{\hspace{2cm}}$$

$$\Delta x = \frac{b - a}{n} = \underline{\hspace{2cm}}$$



(2) Find the following values:

$x_0 = \underline{\hspace{2cm}}$	$f(x_0) = \underline{\hspace{2cm}}$
$x_1 = \underline{\hspace{2cm}}$	$f(x_1) = \underline{\hspace{2cm}}$
$x_2 = \underline{\hspace{2cm}}$	$f(x_2) = \underline{\hspace{2cm}}$
$x_3 = \underline{\hspace{2cm}}$	$f(x_3) = \underline{\hspace{2cm}}$

$f(x_0) = \underline{\hspace{2cm}}$
$2 \cdot f(x_1) = \underline{\hspace{2cm}}$
$2 \cdot f(x_2) = \underline{\hspace{2cm}}$
$f(x_3) = \underline{\hspace{2cm}}$

(3) Sum all the values in the black box. $\hspace{10em} = \underline{\hspace{2cm}}$

(4) Multiply the value found in (3), Δx found in (1), and $1/2$, which yields our answer.

$\underline{\hspace{10cm}}$