MA 16010 LESSON 27: NUMERICAL INTEGRATION (EXAMPLES)

<u>Example 1:</u> 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 = ____________

b = ____________

$b - a$ = ____________

$\Delta x = \dfrac{b-a}{n}$ = ____________

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

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

Hence $f(x) =$ ______________

(3) Find the following values:

x_0 = ____________	$f(x_0)$ = ____________	$f(x_0)$ = ____________
x_1 = ____________	$f(x_1)$ = ____________	$2 \cdot f(x_1)$ = ____________
x_2 = ____________	$f(x_2)$ = ____________	$2 \cdot f(x_2)$ = ____________
x_3 = ____________	$f(x_3)$ = ____________	$f(x_3)$ = ____________

(4) Sum all the values in the black box. = __________________________

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

____

MA 16010 LESSON 27: NUMERICAL INTEGRATION (EXAMPLES)

<u>Example 2:</u> Use the Trapezoid Rule to approximate $\int_2^5 ln(x+3)\ dx$ using $n = 3$. Round your answer to the nearest hundredth.

Solution: (1) First calculate Δx.

a = ________

b = ________

$b-a$ = ________

$\Delta x = \dfrac{b-a}{n}$ = ________

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

$$\int_2^5 \boxed{\ln\left(x^2+3\right)}\ dx$$

Hence $f(x) =$ ________

(3) Find the following values:

x_0	= ________	$f(x_0)$	= ________	$f(x_0)$	= ________
x_1	= ________	$f(x_1)$	= ________	$2 \cdot f(x_1)$	= ________
x_2	= ________	$f(x_2)$	= ________	$2 \cdot f(x_2)$	= ________
x_3	= ________	$f(x_3)$	= ________	$f(x_3)$	= ________

(4) Sum all the values in the black box. = ________________

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

____

MA 16010 LESSON 27: NUMERICAL INTEGRATION (EXAMPLES)

<u>Example 3:</u> Use the Trapezoid Rule to approximate $\int_4^{12} \sqrt{x^3+7}\, dx$ using $n = 4$. Round your answer to the nearest hundredth.

Solution: (1) First calculate Δx.

a = ____________

b = ____________

$b - a$ = ____________

$\Delta x = \dfrac{b-a}{n}$ = ____________

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

$$\int_4^{12} \boxed{\sqrt{x^3+7}}\, dx$$

Hence $f(x) =$ ______________

(3) Find the following values:

x_0	= ____________	$f(x_0)$	= ____________	$f(x_0)$	= ____________
x_1	= ____________	$f(x_1)$	= ____________	$2 \cdot f(x_1)$	= ____________
x_2	= ____________	$f(x_2)$	= ____________	$2 \cdot f(x_2)$	= ____________
x_3	= ____________	$f(x_3)$	= ____________	$2 \cdot f(x_3)$	= ____________
x_4	= ____________	$f(x_4)$	= ____________	$f(x_4)$	= ____________

(4) Sum all the values in the black box. = __________________________

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

____

MA 16010 LESSON 27: NUMERICAL INTEGRATION (EXAMPLES)

<u>Example 4:</u> Approximate the area of the shaded region by using the Trapezoid Rule with $n = 3$

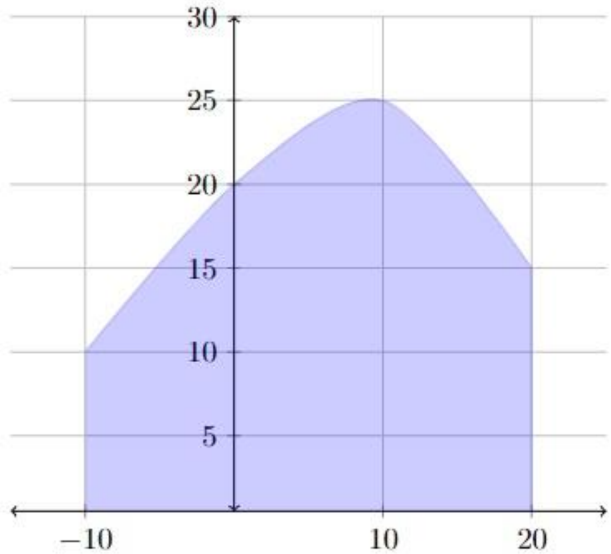
Solution: (1) First calculate Δx.

a = ___________

b = ___________

$b - a$ = ___________

$\Delta x = \dfrac{b-a}{n}$ = ___________



(2) Find the following values:

x_0 = ___________	$f(x_0)$ = ___________	$f(x_0)$ = ___________
x_1 = ___________	$f(x_1)$ = ___________	$2 \cdot f(x_1)$ = ___________
x_2 = ___________	$f(x_2)$ = ___________	$2 \cdot f(x_2)$ = ___________
x_3 = ___________	$f(x_3)$ = ___________	$f(x_3)$ = ___________

(3) Sum all the values in the black box. = ________________________

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

____

MA 16010 LESSON 27: NUMERICAL INTEGRATION (EXAMPLES)

<u>Example 5:</u> Approximate the area of the shaded region by using the Trapezoid Rule with $n = 4$

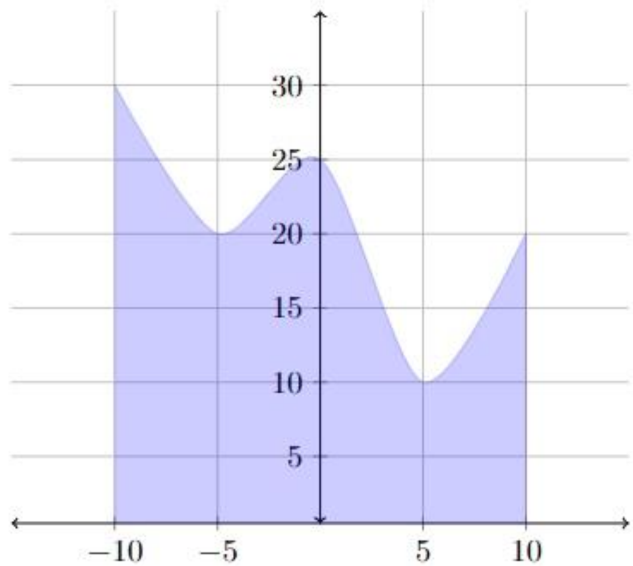
Solution: (1) First calculate Δx.

a = ____________

b = ____________

$b - a$ = ____________

$\Delta x = \dfrac{b-a}{n}$ = ____________



(2) Find the following values:

x_0	= ____________	$f(x_0)$	= ____________	$f(x_0)$	= ____________
x_1	= ____________	$f(x_1)$	= ____________	$2 \cdot f(x_1)$	= ____________
x_2	= ____________	$f(x_2)$	= ____________	$2 \cdot f(x_2)$	= ____________
x_3	= ____________	$f(x_3)$	= ____________	$2 \cdot f(x_3)$	= ____________
x_4	= ____________	$f(x_4)$	= ____________	$f(x_4)$	= ____________

(3) Sum all the values in the black box. = __________________________

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

____