Homework 8.2 – The Definition of Net Area

1. (1 pt) alfredLibrary/AUCI/chapter8/lesson2/defintegral9pet.pg

In this problem you will calculate $\int_1^3 5x\,dx$ by using the formal definition of the definite integral:

$$\int_a^b f(x)\,dx = \lim_{n\to\infty}\left[\sum_{k=1}^n f(x_k^*)\Delta x\right].$$

(a) The interval $[1,3]$ is divided into n equal subintervals of length Δx. What is Δx (in terms of n)?

$\Delta x =$ ______

(b) The right-hand endpoint of the kth subinterval is denoted x_k^*. What is x_k^* (in terms of k and n)?

$x_k^* =$ ______

(c) Using these choices for x_k^* and Δx, the definition tells us that

$$\int_1^3 5x\,dx = \lim_{n\to\infty}\left[\sum_{k=1}^n f(x_k^*)\Delta x\right].$$

What is $f(x_k^*)\Delta x$ (in terms of k and n)?

$f(x_k^*)\Delta x =$ ______

(d) Express $\sum_{k=1}^n f(x_k^*)\Delta x$ in closed form. (Your answer will be in terms of n.)

$\sum_{k=1}^n f(x_k^*)\Delta x =$ ______

(e) Finally, complete the problem by taking the limit as $n\to\infty$ of the expression that you found in the previous part.

$$\int_1^3 5x\,dx = \lim_{n\to\infty}\left[\sum_{k=1}^n f(x_k^*)\Delta x\right] = \text{______}$$

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2. (1 pt) alfredLibrary/AUCI/chapter8/lesson2/right1pet.pg

In this problem you will calculate $\int_0^3 x^2+3\,dx$ by using the formal definition of the definite integral:

$$\int_a^b f(x)\,dx = \lim_{n\to\infty}\left[\sum_{k=1}^n f(x_k^*)\Delta x\right].$$

(a) The interval $[0,3]$ is divided into n equal subintervals of length Δx. What is Δx (in terms of n)?

$\Delta x =$ ______

(b) The right-hand endpoint of the kth subinterval is denoted x_k^*. What is x_k^* (in terms of k and n)?

$x_k^* =$ ______

(c) Using these choices for x_k^* and Δx, the definition tells us that

$$\int_0^3 x^2+3\,dx = \lim_{n\to\infty}\left[\sum_{k=1}^n f(x_k^*)\Delta x\right].$$

What is $f(x_k^*)\Delta x$ (in terms of k and n)?

$f(x_k^*)\Delta x =$ ______

(d) Express $\sum_{k=1}^n f(x_k^*)\Delta x$ in closed form. (Your answer will be in terms of n.)

$\sum_{k=1}^n f(x_k^*)\Delta x =$ ______

(e) Finally, complete the problem by taking the limit as $n\to\infty$ of the expression that you found in the previous part.

$$\int_0^3 x^2+3\,dx = \lim_{n\to\infty}\left[\sum_{k=1}^n f(x_k^*)\Delta x\right] = \text{______}$$

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3. (1 pt) alfredLibrary/AUCI/chapter8/lesson2/absval11pet.pg

Use the properties of the definite integral to evaluate the integral.

$$\int_0^{10} |x^2-5x|\,dx = \text{______}$$

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4. (1 pt) alfredLibrary/AUCI/chapter8/review/props6pet.pg

(a) If $\int_3^9 f(x)dx = -53$, then $\int_9^3 f(x)dx =$ ______

(b) If $\int_1^7 g(x)\,dx = 12$ and $\int_6^7 g(x)\,dx = 3.3$, then $\int_1^6 g(x)\,dx =$ ______

(c) If $\int_5^{11} h(x)\,dx = 3$, $\int_5^7 h(x)\,dx = 2$, and $\int_9^{11} h(x)\,dx = 2$, then $\int_9^7 3h(x)-2\,dx =$ ______