Topic: Properties of integrals

Question: Use properties of integrals to simplify the integral as much as possible.

$$\int_0^2 6x^2 - 5x + 3\ dx$$

Answer choices:

A $\quad 6\int_0^2 x^2\ dx - 5\int_0^2 x\ dx + 3\int_0^2 dx$

B $\quad 6\int_0^2 x^2\ dx - 5\int_2^4 x\ dx + 3\int_4^6 dx$

C $\quad \int_0^2 6x^2\ dx + \int_0^2 5x\ dx + \int_0^2 3\ dx$

D $\quad \int_0^2 6x^2\ dx + \int_2^4 5x\ dx + \int_4^6 3\ dx$

Solution: A

When our function is the sum or difference of two terms, we can separate those terms into different integrals.

$$\int_a^b f(x) + g(x)\ dx = \int_a^b f(x)\ dx + \int_a^b g(x)\ dx$$

$$\int_a^b f(x) - g(x)\ dx = \int_a^b f(x)\ dx - \int_a^b g(x)\ dx$$

Separating the terms in our integral based on these rules, we get

$$\int_0^2 6x^2 - 5x + 3\ dx = \int_0^2 6x^2\ dx - \int_0^2 5x\ dx + \int_0^2 3\ dx$$

We also know that the a constant coefficient which is multiplied by the entire function inside the integral can be pulled out in front of the integral.

$$\int_a^b cf(x)\ dx = c\int_a^b f(x)\ dx$$

Pulling these coefficients out of our integral, we get

$$\int_0^2 6x^2 - 5x + 3\ dx = 6\int_0^2 x^2\ dx - 5\int_0^2 x\ dx + 3\int_0^2 dx$$

Topic: Properties of integrals

Question: Use properties of integrals to simplify the integral as much as possible.

$$\int_{-1}^{5} 9x^3 - 4x^2 - 7x + 18\ dx$$

Answer choices:

A $\quad 9\int_{-1}^{5} x^3\ dx + 4\int_{-1}^{5} x^2\ dx + 7\int_{-1}^{5} x\ dx + 18\int_{-1}^{5}\ dx$

B $\quad 9\int_{-1}^{5} x^3\ dx + 4\int_{1}^{5} x^2\ dx - 7\int_{1}^{5} x\ dx + 18\int_{-1}^{5}\ dx$

C $\quad 9\int_{-1}^{5} x^3\ dx - 4\int_{-1}^{5} x^2\ dx - 7\int_{-1}^{5} x\ dx + 18\int_{-1}^{5}\ dx$

D $\quad 9\int_{-1}^{5} x^3\ dx - 4\int_{1}^{5} x^2\ dx - 7\int_{1}^{5} x\ dx + 18\int_{-1}^{5}\ dx$

Solution: C

When our function is the sum or difference of two terms, we can separate those terms into different integrals.

$$\int_a^b f(x) + g(x)\ dx = \int_a^b f(x)\ dx + \int_a^b g(x)\ dx$$

$$\int_a^b f(x) - g(x)\ dx = \int_a^b f(x)\ dx - \int_a^b g(x)\ dx$$

Separating the terms in our integral based on these rules, we get

$$\int_{-1}^5 9x^3 - 4x^2 - 7x + 18\ dx = \int_{-1}^5 9x^3\ dx - \int_{-1}^5 4x^2\ dx - \int_{-1}^5 7x\ dx + \int_{-1}^5 18\ dx$$

We also know that the a constant coefficient which is multiplied by the entire function inside the integral can be pulled out in front of the integral.

$$\int_a^b cf(x)\ dx = c\int_a^b f(x)\ dx$$

Pulling these coefficients out of our integral, we get

$$\int_{-1}^5 9x^3 - 4x^2 - 7x + 18\ dx = 9\int_{-1}^5 x^3\ dx - 4\int_{-1}^5 x^2\ dx - 7\int_{-1}^5 x\ dx + 18\int_{-1}^5 dx$$

Topic: Properties of integrals

Question: Use properties of integrals to simplify the integral as much as possible.

$$\int_0^{\pi} 8x\ln x - 3x^3 + 4\sin(2x)\ dx$$

Answer choices:

A $\quad 8\int_0^{\pi} x\ln x\ dx + 3\int_0^{\pi} x^3\ dx + 8\int_0^{\pi} \sin(x)\ dx$

B $\quad 8\int_0^{\pi} x\ dx + \int_0^{\pi} \ln x\ dx + 3\int_0^{\pi} x^3\ dx + 4\int_0^{\pi} \sin(2x)\ dx$

C $\quad 8\int_0^{\pi} x\ dx + \int_0^{\pi} \ln x\ dx - 3\int_0^{\pi} x^3\ dx + 4\int_0^{\pi} \sin(2x)\ dx$

D $\quad 8\int_0^{\pi} x\ln x\ dx - 3\int_0^{\pi} x^3\ dx + 4\int_0^{\pi} \sin(2x)\ dx$

Solution: D

When our function is the sum or difference of two terms, we can separate those terms into different integrals.

$$\int_a^b f(x) + g(x)\ dx = \int_a^b f(x)\ dx + \int_a^b g(x)\ dx$$

$$\int_a^b f(x) - g(x)\ dx = \int_a^b f(x)\ dx - \int_a^b g(x)\ dx$$

Separating the terms in our integral based on these rules, we get

$$\int_0^\pi 8x \ln x - 3x^3 + 4\sin(2x)\ dx = \int_0^\pi 8x \ln x\ dx - \int_0^\pi 3x^3\ dx + \int_0^\pi 4\sin(2x)\ dx$$

We also know that the a constant coefficient which is multiplied by the entire function inside the integral can be pulled out in front of the integral.

$$\int_a^b cf(x)\ dx = c\int_a^b f(x)\ dx$$

Pulling these coefficients out of our integral, we get

$$\int_0^\pi 8x \ln x - 3x^3 + 4\sin(2x)\ dx = 8\int_0^\pi x \ln x\ dx - 3\int_0^\pi x^3\ dx + 4\int_0^\pi \sin(2x)\ dx$$