

MATH 110-003 200730 Quiz 9 Solutions

Edward Doolittle

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1. By the Fundamental Theorem of Calculus we have

$$\int_0^1 (1+x^3)^2 \, dx = \int (1+x^3)^2 \, dx \Big|_0^1$$

Evaluating the indefinite integral,

$$\int (1+x^3)^2 \, dx = \int (1+2x^3+x^6) \, dx = x + 2\frac{x^4}{4} + \frac{x^7}{7} + C = x + \frac{x^4}{2} + \frac{x^7}{7} + C$$

Evaluating the definite integral,

$$\int_0^1 (1+x^3)^2 \, dx = x + \frac{x^4}{2} + \frac{x^7}{7} \Big|_0^1 = \left(1 + \frac{1}{2} + \frac{1}{7}\right) - \left(0 + \frac{0}{2} + \frac{0}{7}\right) = 1 + \frac{1}{2} + \frac{1}{7}$$

2. We break the integral into two parts and evaluate each separately:

$$\int_{-1}^3 f(x) \, dx = \int_{-1}^1 f(x) \, dx + \int_1^3 f(x) \, dx$$

The first part is

$$\int_{-1}^1 f(x) \, dx = \int_{-1}^1 (2-x) \, dx = 2x - \frac{x^2}{2} \Big|_{-1}^1 = \left(2(1) - \frac{1^2}{2}\right) - \left(2(-1) - \frac{(-1)^2}{2}\right) = 4$$

and the second part is

$$\int_1^3 f(x) \, dx = \int_1^3 2x^2 - 1 \, dx = 2\frac{x^3}{3} - x \Big|_1^3 = \left(2\frac{3^3}{3} - 3\right) - \left(2\frac{1^3}{3} - 1\right) = 18 - 3 - \frac{2}{3} + 1 = 15\frac{1}{3}$$