

Problem Set 22: Integration using the Fundamental Theorem of Calculus

Key skills: Integration, Fundamental Theorem of Calculus, Antiderivatives

Practice Problems

Calculate the following integrals by directly finding an anti-derivative or using tables. For the indefinite integrals, check your answer by differentiation.

$$a) \int x^3 dx \quad b) \int 3^x dx \quad c) \int (x^2 + x + 1) dx$$

$$d) \int \sin(2x) dx \quad e) \int \frac{1}{x^2} dx \quad f) \int 6 \sec^2 x dx$$

$$g) \int_1^2 \left(\frac{1}{x^2} + x \right) dx \quad h) \int_1^7 e^x dx$$

$$i) \int_{-\pi}^{\pi} \cos x dx \quad j) \int_0^{\pi} (\sin x - \cos x) dx \quad k) \int_{-1}^1 (x - 1)^2 dx$$

PROBLEM SET 22: INTEGRATION USING THE FUNDAMENTAL THEOREM OF CALCULUS2

Answers

$$a) \int x^3 dx = \frac{x^4}{4} + C \quad c) \int 3^x dx = \frac{3^x}{\ln 3} + C \quad b) \int (x^2 + x + 1) dx = \frac{x^3}{3} + \frac{x^2}{2} + x + C$$

$$d) \int \sin(2x) dx = \frac{-\cos(2x)}{2} + C \quad e) \int \frac{1}{x^2} dx = \frac{-1}{x} + C \quad f) \int 6 \sec^2 x dx = 6 \tan x + C$$

$$g) \int_1^2 \left(\frac{1}{x^2} + x \right) dx = 2 \quad h) \int_1^7 e^x dx = e^7 - e$$

$$i) \int_{-\pi}^{\pi} \cos x dx = 0 \quad j) \int_0^{\pi} (\sin x - \cos x) dx = 2 \quad k) \int_{-1}^1 (x - 1)^2 dx = \frac{8}{3}$$