

ASSIGNMENT 2

Tushita Sharva - CS21BTECH11022

Download python code for this question from:

https://github.com/TushitaSharva/PRV_2022/tree/main/ASSIGNMENT_2/codes

Download Latex code from:

https://github.com/TushitaSharva/PRV_2022/tree/main/ASSIGNMENT_2/latex

1. QUESTION

Evaluate:

$$\int \frac{x^3 + 5x^2 + 4x + 1}{x^2} dx$$

2. SOLUTION

Formulas required:

- 1) $\frac{a^m}{a^n} = a^{(m-n)}$
- 2) $\int x^n dx = \frac{x^{n+1}}{n+1} + c$
- 3) $\int \frac{1}{x} dx = \log x + c$

The same expression can be re-written as

$$\int \frac{x^3}{x^2} + \frac{5x^2}{x^2} + \frac{4x}{x^2} + \frac{1}{x^2} dx \quad (1)$$

Using the first formula,

$$\int x + 5 + \frac{4}{x} + \frac{1}{x^2} dx \quad (2)$$

$$\Rightarrow \int x + \int 5 (x^0) + \int \frac{4}{x} + \int \frac{1}{x^2} dx \quad (3)$$

Using fourth formula for the third algebraic term, we get:

$$\int \frac{4}{x} dx = 4 \int \frac{1}{x} \quad (4)$$

$$\Rightarrow 4 \log x + c \quad (5)$$

Using third formula for rest of the terms, we get

$$\int x dx = \frac{x^{(1+1)}}{1+1} + c = \frac{x^2}{2} + c \quad (6)$$

$$\int 5x^0 dx = 5 \times \frac{x^{(0+1)}}{0+1} + c = 5x + c \quad (7)$$

$$\int \frac{1}{x^2} dx = \int x^{-2} dx = \frac{x^{-1}}{-1} + c = \frac{-1}{x} + c \quad (8)$$

Substituting them all in the equation given, we get:

$$\int \frac{x^3 + 5x^2 + 4x + 1}{x^2} dx = \frac{x^2}{2} + 5x + 4 \log x + \frac{-1}{x} + c$$

Final Answer:

$$\frac{x^2}{2} + 5x + 4 \log x + \frac{-1}{x} + c$$