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Sec :- A

Subject :- Numerical Analysis

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Assignment :- 01

Q1:- Review of Integration Concept.

Ans:- It Contain some major Concept of integration, including

- Substitution method.
- Integration by Parts.
- Integration Rational Function.

~ "Substitution method:-"

→ $\int f(g(x))\,g'(x)\,dx = \int f(u)\,du$

If the function $f(u)$ has an easily indentification anti derivatives then all is well. If not, another substitution method may be needed

~ "Integration by Parts:-"

→ $[u(x)v(x)]' = u'(x)v(x) + u(x)v'(x)$

$= u(x)v'(x) = [u(x)v(x)]' - u'(x)v(x)$

$= \int u(x)v'(x)\,dx = u(x)v(x) - \int v'(x)u(x)\,dx$

$= \int u\,dv = uv - \int v\,du$

In case of definate integral we have

$$\int_a^b u(x)v'(x)dx = \left[u(x)v(x)\right]_{x=0}^{x=b} - \int_a^b u'(x)v(x)dx$$

•) "Integrating Rational Function:-"

$$\Rightarrow \frac{3x+2}{2x^2+x-3} = \frac{3x+2}{(2x+3)(x-1)}$$

To integrate such a function, we use the method of partial fraction to split the fraction into easily integrable pieces.

$$\frac{3x+2}{(2x+3)(x-3)} = \frac{1}{2x+3} + \frac{1}{x-1}$$

Now $$\int \frac{3x+2}{2x^2+x-3}\,dx = \frac{1}{2}\log(2x+3) + \log(x-1) + c.$$

Q2:- Application of Trapezoidal Rule and Simpson's Rule in Engineering.

Ans: "Application of Trapezoidal Rule:-"

- The trapezoidal rule is one of the family member of numerical integration formula.
- The trapezoidal rule has faster convergence.
- Moreover, the trapezoidal rule tends to become extremely accurate then periodic functions.

→ "Application of Simpson's Rule:-"

- Simpson's Rule is a numerical method for approximating the integral of a function between two limits, a & b - It's based on knowing the area under a parabola, or a plane curve.
- It include the calculation of a vessel's displacement, total wetted surface area, and the calculation of the longitudinal Center of buoyancy of the hull.
- It is a weighted average that results in an even more accurate approximation.