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Assignment :- 1

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Qno1

Review of Integration Concept

Ans:- It contains some major concept of integration including

- Substitution method
- Integration ~~met~~ 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 identification anti derivatives then all is well. If not another substitution method may be needed.

⇒ Integration by parts :-

$$\begin{aligned} [u(x)v(x)]' &= u'(x)v(x) + u(x)v'(x) \\ &= u(x)v'(x) = [u(x)v(x)]' - u'(x)v(x) \\ &= \int u(x)v'(x)dx = u(x)v(x) - \int u'(x)v(x)dx \\ &= \int udu = uv - \int vdu \end{aligned}$$

In case of definite integral we have

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

⇒ Integrating Rational Function

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

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

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

Now

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

Qno2

Application of Trapezoidal rule and Simpsons 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 than periodic functions

⇒ Application of Simpsons rule:-

- Simpsons rule is a numerical method for approximating the integral of a function between two limits a & b . It is based on knowing the area under a parabola, or a plane curve
- It include the (a) 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 result in an even more accurate approximation