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Subject Numerical analysis.

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Q No 1 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 identification anti-derivation method may be needed.

=> Integration by Parts :-

=> $[u(x)\, u(x)] = u'(x)u(x) + u(x)u'(x)$

$= u(x)\, u'(x) = [u(x)\, u(x)] - u'(x)\, u(x)$

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

$= \int u\, du = uv - \int u\, du.$

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In case of definite Integral we have

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

=> 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 easy integrable pieces.

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

Now

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

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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 extremly accurate when periodic functions.

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Application of Simpson's Rule:

- Simpson's rule is a numerical method for approximating the integral of a function between two limits, a & b. Its based on knowing the area under a parabola, or a plane curve

- It include the calculation of a vessels displacement total method surface area and the calculation of the longitudinal center of bouyancy of the hull.

- It is a weightend average that results in an even more accurate approximation.