16/10/23

Q1. Find the eigen value of $3A + 2I$ of the matrix $A = \begin{bmatrix} 5 & 4 \\ 0 & 2 \end{bmatrix}$

Soln: 5, 2 are Eigen values of A $\because$ Upper triangular matrix

$\Rightarrow 3(5) + 2 = 17$

$\Rightarrow 3(2) + 2 = 8$

17, 8 are Eigen values of $3A + 2I$

UNIT - 2

Differential Calculus

Syllabus :

- Representation of functions - limits of a function - continuity - derivation - differentiation rules (sum, product, quotient, chain rules) - implicit differentiation - logarithimic differentitation - applications : maxima and minima of functions of one variable

4m/8m

8m

	Differentitation	Integration
a)	$\frac{d}{dx}(x^n) = nx^{n-1}$ (1)	$\int x^n dx = \frac{x^{n+1}}{n+1} + C$
	Eg : • $d/dx(x^2) = 2x$ (1) • $d/dx(x) = 1$ • d/dx(constant) $= 0$	Eg : • $\int x^2 dx = x^3/3$ • $\int dx = x$
b)	$\frac{d}{dx}(e^{ax}) = ae^{ax}$	$\int e^{ax} dx = e^{ax}/a$
c)	$\frac{d}{dx}(\sin ax) = a\cos ax$	$\int \sin ax\, dx = \frac{-\cos ax}{a}$
d)	$\frac{d}{dx}(\cos ax) = -a\sin ax$	$\int \cos ax\, dx = \frac{\sin ax}{a}$

e)	$\frac{d}{dx}(\tan ax) = a\sec^2 ax$	$\int \tan ax\,dx = \frac{1}{a}\log(\sec ax)$
f)	$\frac{d}{dx}(\cot ax) = -a\,\mathrm{cosec}^2 ax$	$\int \cot ax\,dx = \frac{1}{a}\log(\sin ax)$
g)	$\frac{d}{dx}(\mathrm{cosec}\,ax) = -a\,\mathrm{cosec}\,ax\,\cot x$	$\int \mathrm{cosec}\,ax\,dx = \frac{1}{a}\log(\mathrm{cosec}\,ax - \cot ax)$
h)	$\frac{d}{dx}(\sec ax) = a\sec x\tan x$	$\int \sec ax\,dx = \frac{1}{a}\log(\sec ax + \tan ax)$

ref: $\cot x = \frac{1}{\tan}$, $\tan x = \frac{1}{\cot x}$

$\mathrm{cosec}\,x = \frac{1}{\sin x}$, $\sec x = \frac{1}{\cot x}$

i)	$d/dx(\log x) = \frac{1}{x}$	$\int \frac{1}{x}dx = \log x$

Q1: Differentiate $\frac{d}{dx}(x^2 + e^{2x} - \log x)$

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

ii) $\frac{d}{dx}(2x^2 + 2e^{2x} - 2\log x)$

$= 4x(1) + 4e^{2x} - 2\left(\frac{1}{x}\right) = 4x + 4e^{2x} - \frac{2}{x}$

UV method:

$$\frac{d}{dx}(uv) = u\frac{dv}{dx} + v\frac{du}{dx}$$

$$\frac{d}{dx}(uv) = uv' + vu'$$

i) Eg: $\frac{d}{dx}(x^2 e^{2x}) = (x^2)(2e^{2x}) + (e^{2x}) + (2x)$

$$= e^{2x}(2x^2 + 2x)$$

$$= 2x\,e^{2x}(x+1)$$

(ii) E.g: $\dfrac{d}{dx}(x e^{3x})$

- $= \dfrac{d}{dx}(x) + \dfrac{d}{dx}(e^{3x}) = (1) + 3e^{3x} = e^{3x}$

- $\dfrac{d}{dx}(uv) = uv' + vu'$

$$= (x)(3e^{3x}) + (e^{3x})(1)$$

$$= e^{3x}(3x+1)$$