BLDE ASSOCIATION'S

S.B.ARTS AND K.C.P SCIENCE COLLEGE, VIJAYAPUR

DEPARTMENT OF MATHEMATICS

ADVANCE LEARNERS

For the Academic Year : 2015-16

BLDE ASSOCIATION'S

S.B.ARTS AND K.C.P SCIENCE COLLEGE, VIJAYAPUR

DEPARTMENT OF MATHEMATICS

Ren cla

SEMINAR REPORT

2015–16 (Even Semester)

BLDE ASSOCIATION'S

S.B.ARTS AND K.C.P SCIENCE COLLEGE, VIJAYAPUR

DEPARTMENT OF MATHEMATICS

NOTICE

The UG Department of Mathematics is conducting Seminar for the B.Sc students for the Academic Year 2015-16 (Even Semester).

I.Q.A.C, Co-ordinator
S.B.Arts & K.C.P.Science College,
Vijayapur.

Principal,
S.B. Arts and KCP Science College
VIJAYAPUR

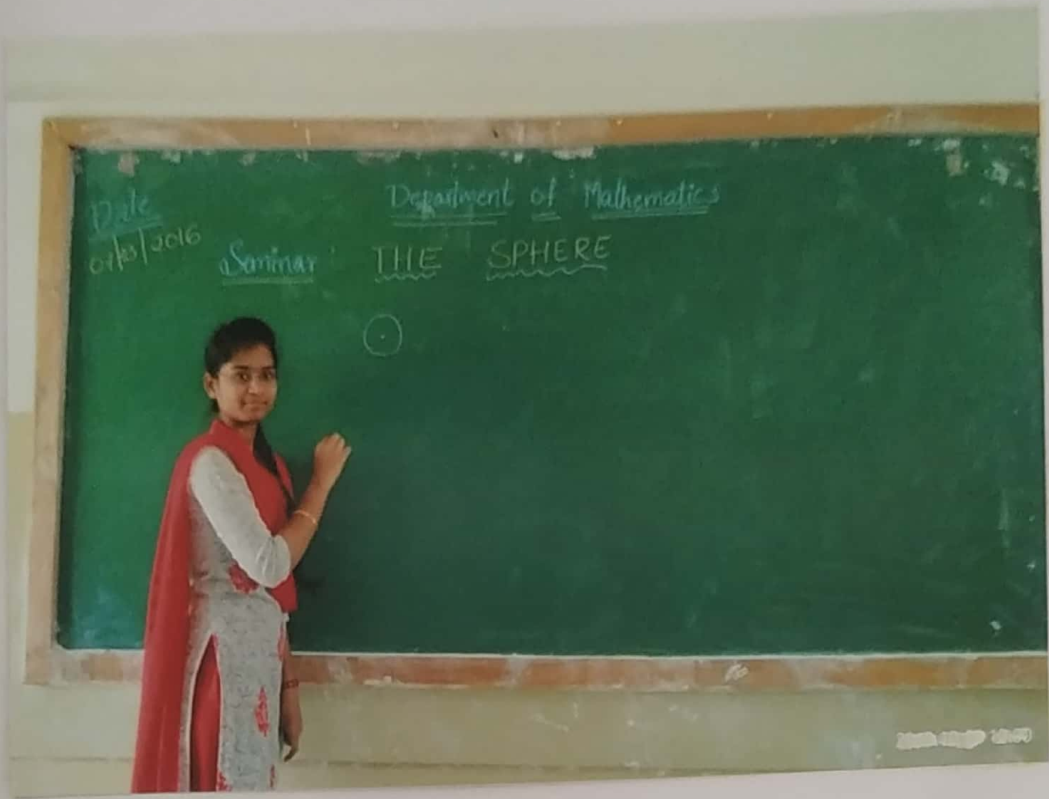
Head of the Department
H. O. D.
Department of Mathematics.
S. B. Arts & K. C. P. Science
College, Bijapur.

B.L.D.E.A's S.B.Arts & K.C.P Science College, Vijayapura

Department of Mathematics

SEMINAR – 2016 (EVEN SEMESTER)

Sl.No	Semester	Name of the students	Topics	Date
1.	II	Suvarna Gidaganti	The Sphere	07/03/2016
2.	IV	Roopanjali Bondarde	Differential equations of nth order	16/03/2016
3.	VI	Shweta Shapeti	Laplace Transformation	23/03/2016



Name : Suvarna Gidaganti

Semester : II

Topic : The sphere

B. L. D. E Association's.

S. B ARTS AND KCP SCIENCE COLLEGE

VIJAYAPURE.

DEPARTMENT OF MATHEMATICS.

Seminar on : SPHERE.

Name :- Suvarna. Gidaganti.

Class :- B. sc II Sem.

Date :- 07/03/2016

Subject :- Mathematics.

SPHERE

Def^n :– A sphere is a perfectly round geometrical object in three dimensional space that is a surface of completely round ball.

Equation of sphere :–

Let $A(a.b.c)$ be a fixed pt in space and let r be any +ve real number and let $P(x,y,z)$ be moving pt such that $AP = r$, a constant.

Squaring on both sides, we get

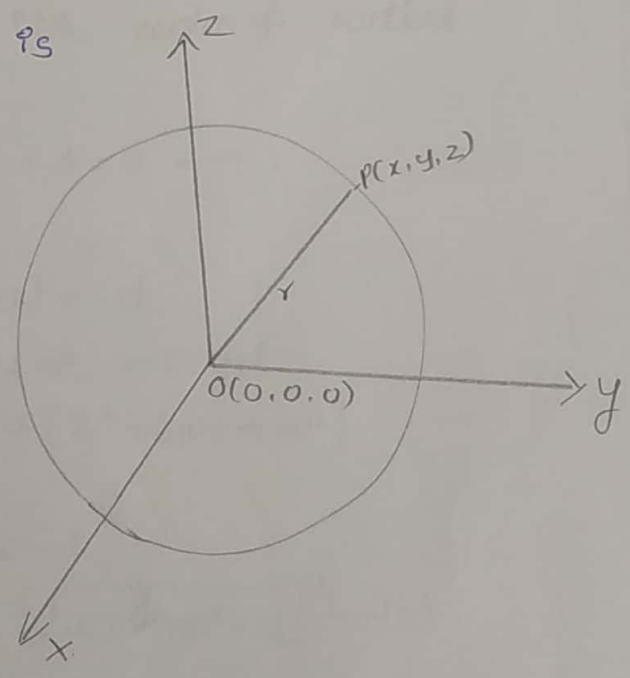
$$(AP)^2 = r^2$$

$$(x-a)^2 + (y-b)^2 + (z-c)^2 = r^2$$

which is required eq^n of sphere with centre $A(a,b,c)$ and radius r.

Equation of sphere in standard form.

i.e eq^n of a sphere whose centre is the origin and radius r.



Let $O = (0.0.0)$ be centre of the sphere.

Let $P(x.y.z)$ be any pt on the sphere. join OP.

since OP is r radius of a sphere

$$OP = r$$

By using distance formula

$$\sqrt{(x-0)^2 + (y-0)^2 + (z-0)^2} = r$$

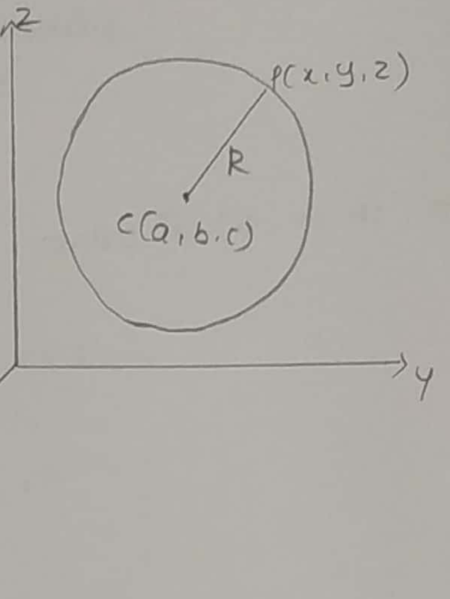
$$\sqrt{x^2 + y^2 + z^2} = r$$

or $x^2 + y^2 + z^2 = r^2$.

which is required equation.

Equation of sphere in central form.

i.e eqⁿ of a sphere whose centre is (a, b, c) and the radius a.



Let $C = (a, b, c)$ be the centre of the sphere

Let $P(x, y, z)$ be any point on the sphere. join CP.

since $CP = r$ (given)

$CP^2 = a^2$

by distance formula

$(x-a)^2 + (y-b)^2 + (z-c)^2 = r^2$.

which is required eqⁿ.

Equation of sphere in General form.

To prove that the eqⁿ $x^2+y^2+z^2+2ux+2vy+2wz+d=0$ represents a sphere and find its centre & radius.

Proof:- Given eqⁿ is

$x^2+y^2+z^2+2ux+2vy+2wz+d=0$ —(1)

which can be rearranged as

$(x^2+2ux)+(y^2+2vy)+(z^2+2wz)=-d$.

adding both side by $u^2+v^2+w^2$, we get

$(x^2+2ux+u^2)+(y^2+2vy+v^2)+(z^2+2wz+w^2)$

$= u^2+v^2+w^2-d$

$(x+u)^2+(y+v)^2+(z+w)^2 = u^2+v^2+w^2-d$.

$[x-(-u)]^2+[y-(-v)]^2+[z-(-w)]^2 = [\sqrt{u^2+v^2+w^2-d}]^2$ —(2)

which is of the form

$(x-a)^2+(y-b)^2+(z-c)^2=r^2$ —(3)

∴ Equation (1) represents a sphere.

Now to find centre and radius of sphere.

For that comparing eqⁿ (2) & (3) we have

$a = -u$, $b = -v$, $c = -w$.

$\therefore r = \sqrt{u^2+v^2+w^2-d}$ is a radius.

& $c = (-u, -v, -w)$ is a centre.

Examples :-

1) Find the eqⁿ of sphere whose centre is $(2, -1, 4)$ and radius is 3 units.

Solⁿ :- $C = (2, -1, 4) = (a, b, c)$ & $r = 3$.

eqⁿ of sphere is

$$(x-a)^2 + (y-b)^2 + (z-c)^2 = r^2$$

put above values

$$(x-2)^2 + (y+1)^2 + (z-4)^2 = 3^2$$

$$x^2+4-4x+y^2+1+2y+z^2+16-8z = 9$$

$$x^2+y^2+z^2-4x+2y-8z+21 = 9$$

$$x^2+y^2+z^2-4x+2y-8z+12 = 0$$ //

2) Find the eqⁿ of a sphere whose centre is $(0, -2, 3)$ & $(2, 6, -1)$ be a pt on the sphere.

Solⁿ: let $C(0, -2, 3)$ & $P(2, 6, -1)$

$$CP = r = \sqrt{(2-0)^2+(6+2)^2+(-1-3)^2}$$

$$= \sqrt{4+64+16}$$

$$r = \sqrt{84}$$

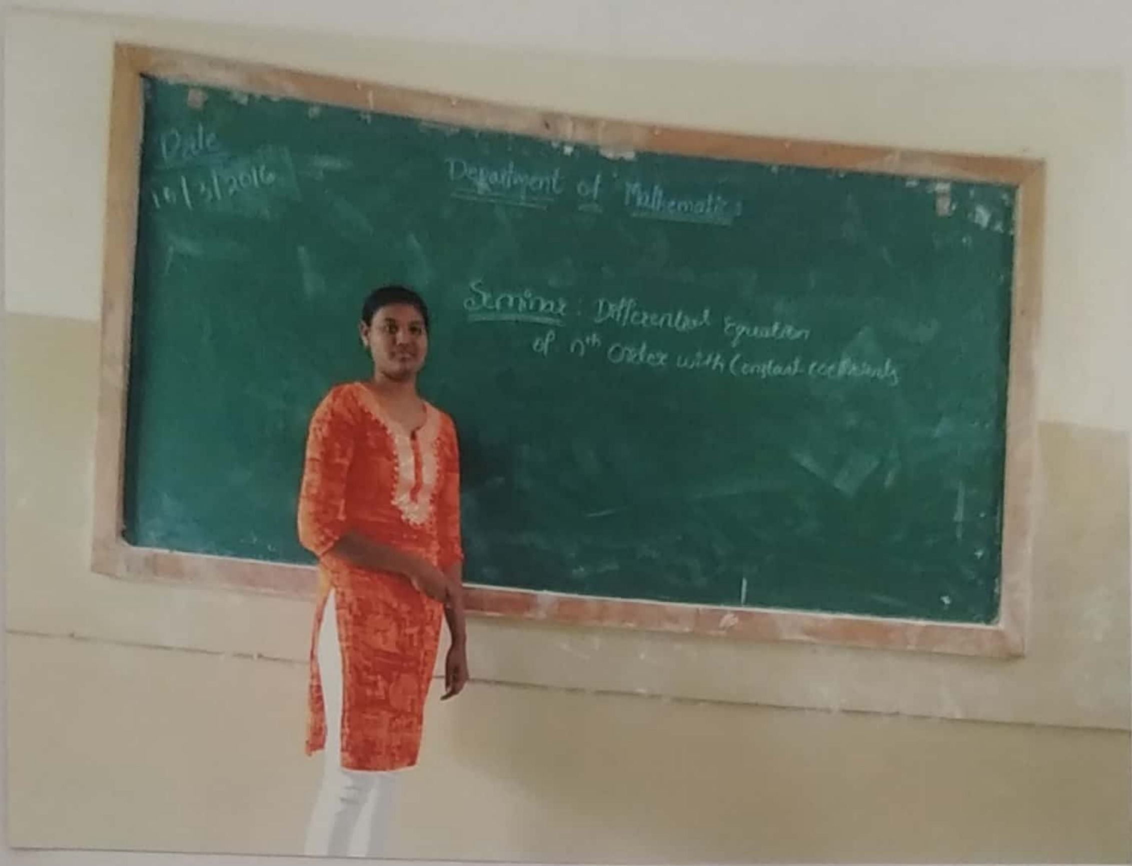
required eqⁿ of sphere is

$$(x-a)^2 + (y-b)^2 + (z-c)^2 = r^2.$$

$$(x-0)^2 + (y+2)^2 + (z-3)^2 = (\sqrt{84})^2.$$

$$x^2+y^2+4+4y+z^2+9-6z = 84$$

$$x^2+y^2+z^2+4y-6z-71 = 0$$ //.



Name : Roopanjali Bondarde

Semester : IV

Topic : Differential Equation of n^{th} order

S.B. Arts & K.C.P Science college Bijapur

Department of Mathematics

Seminar on :- Differential equations of n^{th} order.

Name → Roopanjali . Bondarde
Sem :- BSC IV^{th} sem
Date → 16-03-2016
Reg.No → 81420642

Linear Differential Equations of order n with constant coefficients :-

Linear differential equations constitute a highly important class of differential equations in physics & engineering & are used as idealized mathematical models of such phenomena is mathematical vibrations, electrical circuits, planetary motion etc.

Differential equations of 1st order & 1st degree & first order & higher degree have so far been discussed.

Since the general theory of L.D.E's can be deal with differential & integral equations, a brief review of their properties is in order. The operators discussed below further properly.

★ The Algebra of constant coefficient Operators :-

We define operator D by

$$Dy = \frac{dy}{dx} ; \quad D^2y = \frac{d^2y}{dx^2} \quad \text{--} \quad D^ny = \frac{d^ny}{dx^n}$$

Let us now verify that D is linear. If f_1 & f_2 are differentiable functions the $C_1f_1+C_2f_2$ is differentiable &

$$\frac{d}{dx}(C_1f_1+C_2f_2) = C_1\frac{df_1}{dx} + C_2\frac{df_2}{dx}$$

Where C_1 & C_2 are constant.

But this means that $D(C_1f_1+C_2f_2) = C_1Df_1 + C_2Df_2$.

& D satisfies the ~~equ~~ requirement of linearity. In general, all integral powers of D are linear

$$f(D)(C_1f_1+C_2f_2) = C_1Df_1 + C_2Df_2$$

In general, we shall be interested in $f(D)$, $\phi(D)$ being the rational functions of D. ∴ define their sum & product by

$$[f(D)+\phi(D)]y = f(D)y + \phi(D)y$$

$$f(D)\phi(D)y = f(D)\phi[(D)y]$$

We can therefore treat D, as through it is an algebraic symbol. It follows the expressions with constant ~~constants~~ coefficients can be multiplied & factored like algebraic equations.

We next define $D^{-1}y = \left(\frac{1}{D}\right)y = x$ if $Dx = y$.

The operator $\frac{1}{D}$ according to this relations is the inverse of the operator D (equivalent to integration) in general

$f^{-1}(D)$ or $\frac{1}{f(D)}$ will represent another operator such that $f(D)f^{-1}(D)y = y$.

~~Ext~~ General linear differential equations ->

The complementary function (C.F), the particular integral (P.I), the complete integral (C.I).

The general form of the linear differiatial equation of order n is

$$P_0\frac{d^n y}{dx^n} + P_1\frac{d^{n-1}y}{dx^{n-1}} + \cdots P_{n-1}\frac{dy}{dx} = P_n y = X$$

Where $P_0, P_1, --- P_n$. X are constants or functions of x. By using the symbol D, eqn ① can be written as

$$(P_0D^n + P_1D^{n-1} + --P_n)y = X \quad -(2)$$

or $f(D)y = X$.

Equation ① has been solved completely for $n=1$.

As there is no loss of generality from taking the leading coefficient to be unity, eqn ② may be written as

$$(D^n + P_1D^{n-1} + --P_n)y = X \quad -(3)$$

If $X=0$, the eqn is said to be homogeneous. ~~It is important to note that~~

* Solve $(D^4+6D^3+5D^2-24D-36)y=0$

Sol The A.E is $m^4+6m^3+5m^2-24m-36=0$

$\therefore$ roots of A.E are $2, -2, -3, -3$.

Hence the G.S is

$$y = C_1e^{2x} + C_2e^{-2x} + C_3e^{-3x} + C_4xe^{-3x}$$

* Solve $(D^4-2D^3-3D^2+4D+4)y=0$

$\Rightarrow$ The A.E is $m^4-2m^3-3m^2+4m+4=0$

$\Rightarrow m^4-2m^3-3m^2 \overset{+6m}{-2m}+4=0$

$\Rightarrow m^3(m-2)-3m(m-2)-2(m-2)=0$

$\Rightarrow (m-2)(m^3-3m-2)=0$

$\Rightarrow (m-2)^2(m+1)^2=0$

The roots of A.E are $2, 2, -1, -1$

The G.S is $y=e^{2x}(c_1+c_2x)+e^{-x}(c_3+c_4x)$

* Solve $(D^4+5D^2-36)y=0$

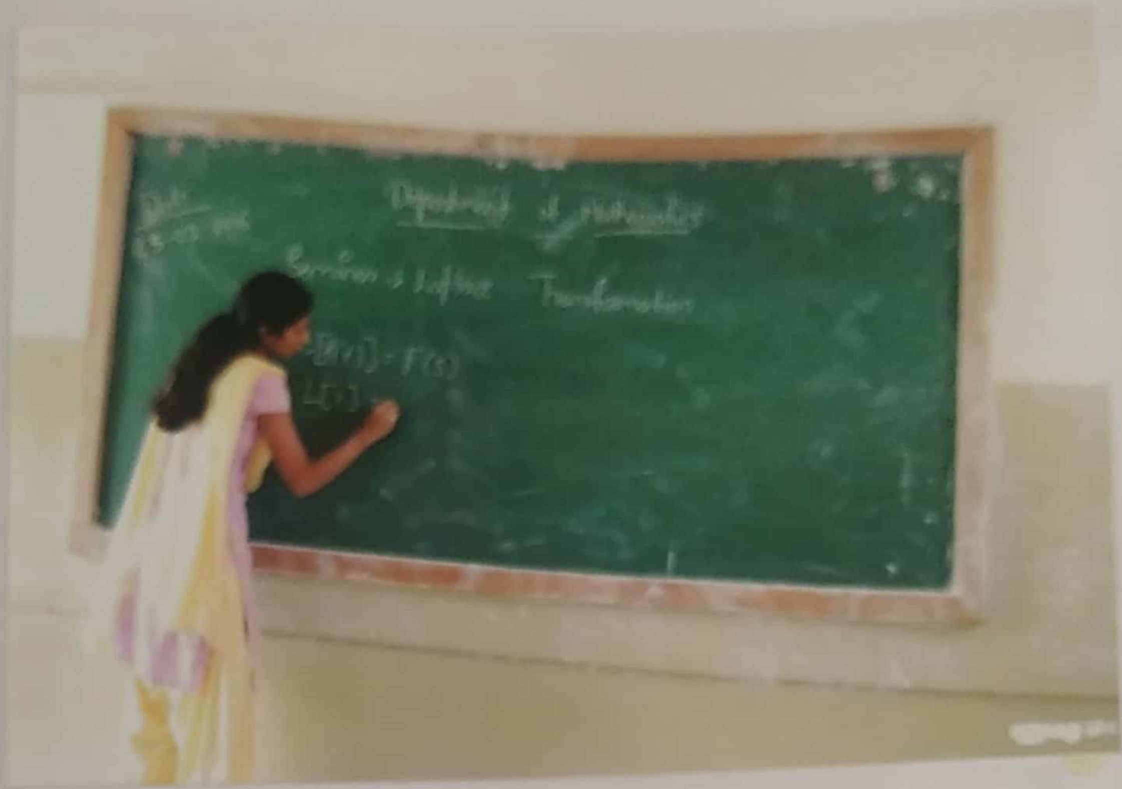
$\Rightarrow$ The A.E is $m^4+5m^2-36=0$

or $(m^2-4)(m^2+9)=0$

The roots of A.E are $\pm 2, \pm 3i$ &

The G.S is $y=c_1e^{2x}+c_2e^{-2x}+c_3\cos 3x+c_4\sin 3x$

Scanned with CamScanner



Name : Shweta Shapeti

Semester : VI

Topic : Laplace Transformation

S. B. Arts & R.C.P Science college, Bijapur.

Seminar

Name -> Shweta. C. Shapeti

Reg. No -> S1319909

Dept. -> Mathematics

Sem -> Bsc. VIth sem.

Topic -> Laplace Transformation.

Date -> 23-03-2016.

Laplace Transform

Let $f(t)$ be a function of a real variable 't' defined for $t \geq 0$.

Laplace transform of $f(t)$ is denoted by $L[f(t)]$ and is defined by.

$$L[f(t)] = \int_0^\infty e^{-st} f(t)\,dt$$

Provided the integral on the right hand exist, where 's' is a parameter, a real or a complex number. The operator L is called Laplace transform operator.

Clearly, the $L[f(t)]$ is a function of the parameter s. we denote this function by $F(S)$

Thus, $L[f(t)] = \int_0^\infty e^{-st} f(t)\,dt = F(S)$

Linearity property →

If $f(t)$ and $g(t)$ are two functions whose Laplace transforms exist and if a and b are any constants, then

Proof:- By definition of Laplace transforms [L.T.]

$$L[af(t)+bg(t)] = \int_0^\infty e^{-st}[af(t)+bg(t)\,dt$$
$$= \int_0^\infty [ae^{-st}f(t) + be^{-st}g(t)]\,dt$$
$$= a\int_0^\infty e^{-st}f(t)\,dt + b\int_0^\infty e^{-st}g(t)\,dt$$
$$= aL[f(t)] + bL[g(t)]$$
$$\therefore L[af(t)+bg(t)] = aL[f(t)]+bL[g(t)]$$

Transform of Elementary Functions :-

1. $L[e^{at}]$

Soln:- By definiton of L.T.

$$L[e^{at}] = \int_0^\infty e^{-st}e^{at}\,dt = \int_0^\infty e^{-(s-a)t}\,dt$$
$$= \left[\frac{e^{-(s-a)t}}{-(s-a)}\right]_0^\infty = \frac{e^{-\infty}}{-(s-a)} - \frac{e^{0}}{-(s-a)}$$
$$= 0 + \frac{1}{s-a} \qquad (\because e^{-\infty} = 0 \ \& \ e^0 = 1)$$
$$= \frac{1}{s-a}$$
$$\therefore L[e^{at}] = \frac{1}{s-a}, \quad s-a>0$$

Scanned with CamScanner

2. $L[e^{-at}]$

Soln, → By definition of L.T

$$L[e^{-at}] = \int_0^\infty e^{-st} e^{-at}\, dt$$

$$= \int_0^\infty e^{-(s+a)t}\, dt = \left[\frac{e^{-(s+a)t}}{-(s+a)}\right]_0^\infty$$

$$= \frac{e^{-\infty}}{-(s+a)} - \frac{e^{0}}{-(s+a)}$$

$$= 0 + \frac{1}{s+a} \quad (\because e^{-\infty} = 0 \ \& \ e^{0} = 1)$$

$$= \frac{1}{s+a}$$

$$\therefore L[e^{-at}] = \frac{1}{s+a}, \quad s+a>0$$

3) $L[\cos at]$ and $L[\sin at]$

Soln, → we know that

$$e^{iat} = \cos at + i \sin at \quad (\because e^{i\theta} = \cos\theta + i\sin\theta)$$

By definition of L.T

$$L[e^{iat}] = \int_0^\infty e^{-st} e^{iat}\, dt$$

$$= \int_0^\infty e^{-(s-ia)t}\, dt = \left[\frac{e^{-(s-ia)t}}{-(s-ia)}\right]_0^\infty$$

$$= \frac{e^{-\infty}}{-(s-ia)} - \frac{e^{-0}}{-(s-ia)} = 0 + \frac{1}{(s-ia)}$$

$$(\because e^{-\infty} = 0 \ \& \ e^{0} = 1)$$

$$= \frac{1}{(s-ia)}$$

$$= \frac{1}{(s-ia)} \times \frac{(s+ia)}{(s+ia)}$$

$$= \frac{s+ia}{s^2-(ia)^2} = \frac{s+ia}{s^2+a^2}$$

$$L[e^{iat}] = \frac{s+ia}{s^2+a^2}$$

$$L[e^{iat}] = \frac{s}{s^2+a^2} + \frac{ia}{s^2+a^2}$$

$$L[\cos at] + iL[\sin at] = \frac{s}{s^2+a^2} + i\frac{a}{s^2+a^2}$$

Comparing real and imagianary parts, we get

$$L[\cos at] = \frac{s}{s^2+a^2} \text{ and } L[\sin at] = \frac{a}{s^2+a^2}$$

4) i) $L[\cosh at]$ ii) $L[\sinh at]$

Soln →

is we know that $\cosh at = \frac{e^{at} + e^{-at}}{2}$

$$L[\cosh at] = \frac{1}{2} L[e^{at} + e^{-at}]$$

$$L[e^{at} + e^{-at}] = \int_0^\infty e^{-st} [e^{at} + e^{-at}] dt$$

$$= \int_0^\infty e^{-st} e^{at} + e^{-st} e^{-at} dt$$

$$= \int_0^\infty e^{-(s-a)t} + e^{-(s+a)} dt$$

$$= \int_0^{\infty} e^{-(s-a)t}\, dt + \int_0^{\infty} e^{-(s+a)t}\, dt$$

$$= \left[\frac{e^{-(s-a)t}}{-(s-a)}\right]_0^{\infty} + \left[\frac{e^{-(s+a)t}}{-(s+a)}\right]_0^{\infty}$$

$$= \left[\frac{e^{-\infty}}{-(s-a)} - \frac{e^{0}}{-(s-a)}\right] + \left[\frac{e^{-\infty}}{-(s-a)} - \frac{e^{-0}}{-(s-a)}\right]$$

$$= \frac{1}{s-a} + \frac{1}{s+a}$$

$$= \frac{s+a+s-a}{(s+a)(s-a)}$$

$$L[e^{at}+e^{-at}] = \frac{2s}{(s+a)(s-a)} = \frac{2s}{s^2-a^2}$$

$$L[\cosh at] = \frac{1}{2}[e^{at}+e^{-at}]$$

$$= \frac{1}{2}\frac{2s}{s^2-a^2}$$

$$\therefore L[\cosh at] = \frac{s}{s^2-a^2}$$

ii) We know that $\sinh at = \frac{e^{at}-e^{-at}}{2}$

$$L(\sinh at) = \frac{1}{2}L[e^{at}-e^{-at}]$$

$$L[e^{at}-e^{-at}] = \int_0^{\infty} e^{-st}[e^{at}-e^{-at}]\,dt$$

$$= \int_0^{\infty} e^{-st}e^{at} - e^{-st}e^{-at}\, dt$$

$$= \int_0^{\infty} e^{-(s-a)t} - e^{-(s+a)}\, dt$$

Scanned with CamScanner

$$= \int_0^\infty e^{-(s-a)t}\,dt - \int_0^\infty e^{-(s+a)t}\,dt$$

$$= \left.\frac{e^{-(s-a)t}}{-(s-a)}\right]_0^\infty - \left.\frac{e^{-(s+a)t}}{-(s+a)}\right]_0^\infty$$

$$= \frac{e^{-\infty}}{-(s-a)} - \frac{e^0}{-(s-a)} - \frac{e^{-\infty}}{-(s+a)} + \frac{e^0}{-(s+a)}$$

$$= 0 + \frac{1}{s-a} - \frac{1}{s+a}$$

$$= \frac{s+a \cancel{+} s+a}{s^2-a^2} \quad \frac{=2a}{s^2-a^2}$$

$$L[\cancel{sh}\ \sinh at] = \frac{1}{2}\,\frac{2a}{s^2-a^2}$$

$$\therefore L[\sinh at] = \frac{a}{s^2-a^2}$$

5) $L[t^n]$, $n \geq 0$

Soln, $\rightarrow$ By definition of L.T.

$$L[t^n] = \int_0^\infty e^{-st}\, t^n\, dt$$

$$= t^n \left.\frac{e^{-st}}{-s}\right]_0^\infty - \int_0^\infty \frac{e^{-st}}{-s}\, n t^{n-1}\, dt$$

$$= 0 + \frac{n}{s}\int_0^\infty e^{-st}\, t^{n-1}\, dt$$

$$= \frac{n}{s} \cdot L[t^{n-1}]$$

Now $L[t^{n-1}] = \int_0^\infty e^{-st}\, t^{n-1}\, dt$

Scanned with CamScanner

Integrating by parts

$$L[t^{n-1}] = t^{n-1}\left.\frac{e^{-st}}{-s}\right]_0^\infty - \int_0^\infty \frac{e^{-st}}{-s}(n-1)t^{n-2}\,dt.$$

$$= 0 + \frac{n-1}{s}\int_0^\infty e^{-st}\,t^{n-2}\,dt$$

$$= \frac{n-1}{s}L[t^{n-2}]$$

$$L[t^{n-1}] = \frac{n(n-1)}{s^2}L[t^{n-2}]$$

Continuing this process we get.

$$L[t^n] = \frac{n(n-1)(n-2)(n-3)\ldots 3\times 2\times 1}{s^n}L[t^0]$$

$$= \frac{n!}{s^n}L[1]$$

$$\therefore L[1] = \int_0^\infty e^{-st}\,1\,dt = \left[\frac{e^{-st}}{-s}\right]_0^\infty = \frac{e^{-\infty}}{-s} - \frac{e^0}{+s}$$

$$= 0 + \frac{1}{s} \qquad (\because e^{-\infty} = 0)$$

$$\therefore L[1] = \frac{1}{s}$$

$$\therefore L[t^n] = \frac{n!}{s^n}\frac{1}{s} = \frac{n!}{s^{n+1}}$$

BLDE ASSOCIATION'S

S.B.ARTS AND K.C.P SCIENCE COLLEGE, VIJAYAPUR

DEPARTMENT OF MATHEMATICS

SEMINAR REPORT: 2015-16
(Even Semester)

The UG Department of Mathematics has conducted seminar for B.Sc students.

Name of the student	Seminar Topic
1) Suvarna Gidaganti	The sphere
2) Roopanjali Bondarde	Diff eqns of nth order
3) Shweta Shapeti	Laplace transformat

Head of Department
H. O. D:
Department of Mathematics,
S. B. Arts & K. C. P. Science
College, BIJAPUR,

Principal
Principal,
S. B. Arts & KCP Sc
Bij

IQAC, Co-ordinator
S.B Arts & K.C.P.Science College,
Vijayapur.