Laplace Transform

MCQ's

Dost se Accha
Koi Teacher nai

1. If f(t) = t^n where, 'n' is an integer greater than zero, then its Laplace Transform is given by?
a) n!
b) t^{n+1}
c) $n!/s^{n+1}$
d) Does not exist

2. If f(t)=√t, then its Laplace Transform is given by?
a) ½
b) $1/s$
c) $\sqrt{\pi}/2\sqrt{s}$
d) Does not exist

3. If f(t) = sin(at), then its Laplace Transform is given by?
a) cos(at)
b) $1/a^{\sin(at)}$
c) Indeterminate
d) a/s^2+a^2

4. If f(t) = tcos(at), its Laplace transform is given by?
a) 1/s-a
b) $s^2 - a^2/(s^2+a^2)^2$
c) Indeterminate
d) s^2at

5. If f(t) = e^{at}, its Laplace Transform is given by?
a) a/s^2+a^2
b) $\sqrt{\pi}/2\sqrt{s}$
c) 1/s-a
d) Does not exist

6. If f(t) = sin(at) – atcos(at), then its Laplace transform is given by?
a) Indeterminate form is encountered
b) $a^3/(s^2 + a^2)^2$
c) $2a^3/(s^2 - a^2)^2$
d) $2a^3/(s^2 + a^2)^2$

7. If f(t) = cos(at) + atsin(at), its Laplace transform is given by?
a) (s+a)/(s−a)
b) $a^3/(s^2+a^2)2$
c) $s(s^2+3a^2)/(s^2+a^2)^2$
d) Does not exist

8. If f(t) = cos(at + b), its Laplace transform is given by?
a) $a/[s^2+a^2]$
b) $2as/[(s^2+a^2)^2]$
c) $[s\cos(b)-a\sin(b)]/s^2+a^2$
d) Does not exist

9. If f(t) = coshat, its Laplace transform is given by?
a) s/s^2-a^2
b) s+a/s-a
c) Indeterminate
d) $(\sinh(at))^2$

10 If f(t) = $e^{at}\cos(bt)$, then its Laplace transform is?
a) $2a^3/(s^2 + a^2)$
b) (s+a)/(s-a)
c) Indeterminate
d) $(s-a)/[(s - a)^2 + b^2]$

11. If f(t) = $\frac{1}{a}\sinh(at)$, then its Laplace transform is?
a) $1/s^2-a^2$
b) $2a/(s - b)^2 + b^2$
c) $n!/(s - a)^{n-1}$
d) Does not exist

12. If f(t) = $\frac{t}{2}$*asinat, then its Laplace transform is?
a) $b/(s + a)^2 + b^2$
b) $2a/(s - b)^2 + b^2$
c) Indeterminate
d) $s/(s^2 + a^2)^2$

13. If f(t) = te^{-at}, then its Laplace transform is?
a) $1/(s+a)^2$
b) $2a/[(s-b)^2+b^2]$
c) $a^3/(s^2+a^2)^2$
d) Indeterminate

14. If L { f(t) } = F(s), then L {kf(t)} = ?
a) F(s)
b) k F(s)
c) Does not exist
d) $F(\frac{s}{k})$

15. Laplace transform if sin(at)u(t) is?

a) s/a^2+s^2
b) a/a^2+s^2
c) s^2/a^2+s^2
d) a^2/a^2+s^2

16. Laplace transform if cos(at)u(t) is?

a) s/a^2+s^2
b) a/a^2+s^2
c) s^2/a^2+s
d) a^2/a^2+s^2

17. Find the Laplace transform of e^t Sin(at) for $0<t<\pi$ and $f(t)=0$ for $t>\pi$

a) $a/[a^2+(s+1)^2]$
b) $a/[a^2+(s-1)^2]$
c) $s+1)/[a^2+(s+1)^2]$
d) $(s+1)/[a^2+(s+1)^2]$

omit

18. Laplace transform of t^2 sin(2t).

a) $[(12s^2-16)/(s2+4)^4]$
b) $[(3s^2-4)/(s2+4)^3]$
c) $[(12s^2-16)/(s2+4)^6]$
d) $[(12s^2-16)/(s2+4)^3]$

19. Find the laplace transform of $t^{5/2}$.

a) $\frac{15}{8}\sqrt{\pi}s^{5/2}$
b) $\frac{15}{8}\sqrt{\pi}s^{7/2}$
c) $\frac{9}{4}\sqrt{\pi}s^{7/2}$
d) $\frac{15}{4}\sqrt{\pi}s^{7/2}$

20. Value of $\int_{-\infty}^{\infty} e^t \mathrm{Sin}(t)\mathrm{Cos}(t)dt$ = ?

a) 0.5
b) 0.75
c) 0.2
d) 0.71

21. Find the laplace transform of $y(t)=e^t.t.\mathrm{Sin}(t)\mathrm{Cos}(t)$.

a) $4(s-1) / [(s-1)2+4]^2$
b) $2(s+1) / [(s+1)2+4]^2$
c) $4(s+1) / [(s+1)2+4]^2$
d) $2(s-1) / [(s-1)2+4]^2$

22. Find the value of $\int_0^\infty t\sin(t)\cos(t)$.
a) s/s^2+2^2
b) a/a^2+s^4
c) 1
d) 0

23. Find the $L{-}1(\frac{s+3}{4s^2+9})$.
a) $\frac{1}{4}\cos(3t/2)+\frac{1}{2}\cos(3t/2)$
b) $\frac{1}{4}\cos(3t/4)+\frac{1}{2}\sin(3t/2)$
c) $\frac{1}{2}\cos(3t/2)+\frac{1}{2}\sin(3t/2)$
d) $\frac{1}{4}\cos(3t/2)+\frac{1}{2}\sin(3t/2)$

24. Find the $L{-}1(1/(s+2)^4)$.
a) $e^{-2t}\times 3$
b) $e^{-2t}\times t^3/3$
c) $e^{-2t}\times t^3/6$
d) $e^{-2t}\times t^2/6$

25. Find the $L{-}1(s(s-1)7)$.
a) $e^{-t}(\frac{t^6}{5!}+\frac{t^5}{6!})$
b) $e^{t}(\frac{t^6}{5!}+\frac{t^6}{6!})$
c) $e^{t}(\frac{t^6}{6!}+\frac{t^5}{5!})$
d) $e^{-t}(\frac{t^6}{6!}+\frac{t^5}{5!})$

26. Find the $L{-}1(\frac{s}{2s+9+s^2})$.
a) $e^{-t}\{\cos(2\sqrt{2t})-\sin(2t\sqrt{2t})\}$
b) $e^{-t}\{\cos(2\sqrt{2t})-\sin(2\sqrt{2t})\}$
c) $e^{-t}\{\cos(2\sqrt{2t})-\cos(2\sqrt{2t})\}$
d) $e^{-2t}\{\cos(2\sqrt{2t})-\sin(2\sqrt{2t})\}$

27. Find the $L{-}1((s+1)(s+2)(s+3))$.
a) $2e^{-3t}-e^{-2t}$
b) $3e^{-3t}-e^{-2t}$
c) $2e^{-3t}-3e^{-2t}$
d) $2e^{-2t}-e^{-t}$

28. Find the $L-1(\frac{(3s+9)}{(s+1)(s-1)(s-2)})$.

a) $e^{-t}+6e^{t}+5e^{2t}$
b) $e^{-t}-e^{t}+5e^{2t}$
c) $e^{-3t}-6e^{t}+5e^{2t}$
d) $e^{-t}-6e^{t}+5e^{2t}$

29. Find the $L-1(1(s2+4)\ (s2+9))$.

a) $\frac{1}{5}\ (\sin(2t)/2-\sin(t)/3)$
b) $\frac{1}{5}\ (\sin(2t)/2+\sin(3t)/3)$
c) $\frac{1}{5}\ (\sin(t)/2-\sin(3t)/3)$
d) $\frac{1}{5}\ (\sin(2t)/2-\sin(3t)/3)$

30. Find the $L-1(\frac{s}{s^2+1)(s^2+2)(s^2+3)})$

a) $\frac{1}{2}\cos(t)-\cos(\sqrt{3t})-\frac{1}{2}\cos(\sqrt{3t})$
b) $\frac{1}{2}\cos(t)+\cos(\sqrt{2t}))-\frac{1}{2}\cos(\sqrt{3t})$ `
c) $\frac{1}{2}\cos(t)-\cos(\sqrt{2t}))-\frac{1}{2}\cos(\sqrt{3t})$
d) $\frac{1}{2}\cos(t)+\cos(\sqrt{2t})+\frac{1}{2}\cos(\sqrt{3t})$

31. Find the $L-1(\frac{s+1}{(s-1)(s+2)^2})$.

a) $\frac{2}{7}e^{t}-\frac{2}{9}e^{-2t}+\frac{1}{3}e^{-2t}\times t$
b) $\frac{2}{9}e^{t}-\frac{2}{9}e^{-2t}+\frac{1}{3}e^{-2t}\times t$
c) $\frac{2}{9}e^{t}-\frac{2}{9}e^{-3t}+\frac{1}{3}e^{-2t}\times t$
d) $\frac{2}{9}e^{t}-\frac{2}{9}e^{-2t}+\frac{1}{3}e^{-2t}$

32Find the $L-1(1/s(s^2+4))$.

a) $[1-\sin(t)]/4$
b) $[1-\cos(t)]/4$
c) $[1-\sin(2t)]/4$
d) $[1-\cos(2t)]/4$

33. Find the $L-1[s/(s^2+4)^2]$.

a) $\frac{1}{4}\ t\cos(2t)$
b) $\frac{1}{4}\ t\sin(t)$
c) $\frac{1}{4}\ t\sin(2t)$
d) $\frac{1}{2}\ t\sin(2t)$

34. Solve the Ordinary Differential Equation by Laplace Transformation y'' – 2y' – 8y = 0 if y(0) = 3 and y'(0) = 6.

a) $3e^{t}\cos(3t)+t\sin t(3t)$
b) $3e^{t}\cos(3t)+te^{-t}\sin t(3t)$
c) $2e^{-t}\cos(3t)-2\frac{t}{3}\sin t(3t)$
d) $2e^{-t}\cos(3t)-2t\frac{e^{-t}}{3}\sin t(3t)$

35. Solve the Ordinary Differential Equation using Laplace Transformation y''' – 3y'' + 3y' – y = $t^2 e^t$ when y(0) = 1, y'(0) = 0 and y''(0) = 2.

a) $2e^{t}\frac{t^5}{720}+e^{t}+2e^{t}\frac{t}{6}+4e^{t}\frac{t^2}{24}$
b) $e^{t}\frac{t^5}{720}+2e^{-t}+2e^{t}\frac{t}{6}+4e^{t}\frac{t^2}{24}$
c) $e^{-t}\frac{t^5}{720}+e^{-t}+2e^{-t}\frac{t}{6}+4e^{-t}\frac{t^2}{24}$
d) $2e^{-t}\frac{t^5}{720}+e^{-t}+2e^{-t}\frac{t}{6}+4e^{-t}\frac{t^2}{24}$

Laplace Transform

Q1] c

Q2] c

Q3] d

Q4] b

Q5] c

Q6] d

Q7] c

Q8] c

Q9] a

Q10] d

Q11] a

Q12] d

Q13] a

Q14] b

Q15] b

Q16] a

Q17] b

Q18] d

Q19] b

Q20] c

Q21] d

Q22] d

Q23] d

Q24] c

Q25] c

Q26] b

Q27] a

Q28] d

Q29] d

Q30] c

Q31] b

Q32] d

Q33] c

Q34] a

Q35] a

1.] If $f(t) = t^n$ where, 'n' is an integer greater than zero, then its Laplace Transform is given by?

Answer:- c

Explanation:- The Laplace Transform of a function is given by

$$\mathcal{L}\{f(t)\} = F(s) = \int_0^\infty f(t)e^{-st}\,dt$$

$$f(t) = t^n$$

On simplifying, we get $n!/s^{n+1}$

2.] If $f(t) = \sqrt{t}$, then its Laplace Transform is given by?

Answer:- c

Explanation:- The Laplace Transform of a function is given by?

$$\mathcal{L}\{f(t)\} = F(s) = \int_0^\infty f(t)e^{-st}\,dt$$

Put $f(t) = \sqrt{t}$

On solving, we get $\sqrt{\pi}/2\sqrt{s}$

3.] If $f(t) = \sin(at)$, then its Laplace Transform is given by?

Answer:- d

Explanation:- The Laplace Transform of a functions is given by

$$\mathcal{L}\{f(t)\} = F(s) = \int_0^\infty f(t)e^{-st}\,dt$$

Put $f(t) = \sin(at)$

On solving, we get $a/s^2 + a^2$

4] If $f(t) = t\cos(at)$, its Laplace Transform is given by?

Answer:- b

Explanation:- The Laplace Transform function is given by

$$\mathcal{L}\{f(t)\} = F(s) = \int_0^\infty f(t)e^{-st}dt$$

Put $f(t) = t\cos(at)$

On solving the above integral, using suitable rules of integration we get the answer $s^2 - a^2 / (s^2+a^2)^2$

5] If $f(t) = e^{at}$, its Laplace Transform is given by?

Answer:- c

Explanation:- The Laplace Transform of a function is given by

$$\mathcal{L}\{f(t)\} = F(s) = \int_0^\infty f(t)e^{-st}dt$$

Put $f(t) = e^{at}$

On solving the above integral, we obtain $1/s-a$.

6] If $f(t) = \sin(at) - at\cos(at)$, then its Laplace transform is given by?

Answer:- d

Explanation:- The Laplace Transform of a function is given by

$$\mathcal{L}\{f(t)\} = F(s) = \int_0^\infty f(t)e^{-st}dt$$

Put $f(t) = \sin(at) - at\cos(at)$

On solving the above integral, we obtain the answer

$2a^3 / (s^2+a^2)^2$

7] If $f(t) = \cos(at) + at\sin(at)$, its Laplace transform is given by?

Answer:- c

Explanation:- The Laplace transform of a function is given by

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

Put $f(t) = \cos(at) + at\sin(at)$ to solve the problem.

8] If $f(t) = \cos(at+b)$, its Laplace transform is given by?

Answer:- c

Explanation:- The Laplace Transform of a function is given by

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

Put $f(t) = \cos(at+b)$ to solve the problem.

9] If $f(t) = \cosh at$, its Laplace transform is given by?

Answer:- a

Explanation:- The Laplace transform of a function is given by

$$\{f(t)\} = F(s) = \int_0^\infty f(t)e^{-st}\,dt$$

put $f(t) = \cosh at$

On Solving, we obtain $\boxed{s/s^2-a^2}$

10] If $f(t) = e^{at}\cos(bt)$, then its Laplace transform is?

Answer:- d

Explanation:- The Laplace transform of a function is given by

$$\{f(t)\} = F(s) = \int_0^\infty f(t)e^{-st}\,dt$$

put $f(t) = e^{at}\cos(bt)$

Solving the above integral to obtain $s-a/(s-a)^2+b^2$

Q11] If $f(t) = 1/a \sinh(at)$, then its Laplace transform is?

Answer:- a

Explanation:- The Laplace transform of a function is given by

$$\{f(t)\} = F(s) = \int_0^\infty f(t)e^{-st}\,bt$$

Put $f(t) = f(t) = 1/a \sinh(at)$

On solving the above integral, we get the $1/s^2-a^2$

Q12] If $f(t) = t/2 * a\sin at$, then its Laplace transform is?

Answer:- d

Explanation:- The Laplace transform of a function is given by

$$\{f(t)\} = F(s) = \int_0^\infty f(t)e^{-st}\,dt$$

put $f(t) = t/2\, a\sin at$

Integrate to obtain, the required transform

$s/(s^2+a^2)^2$

13] If $f(t) = te^{-at}$, then its Laplace transform is?

Answer:- a

Explanation:- The Laplace transform of a function is given by

$$\{f(t)\} = F(s) = \int_0^{\infty} f(t)e^{-st}\, dt$$

put $f(t) = te^{-at}$

On solving, the required answer is obtained.

14] If $L\{f(t)\} = F(s)$, the $L\{Kf(t)\} = ?$

Answer:- b

Explanation:- This is the Linearity property of Laplace transform.

15] Laplace transform of $\sin(at)u(t)$ is?

Answer:- b

Explanation:- We know that,

$F(s) =$

$$\int_{-\infty}^{\infty} \sin(at)u(t)e^{-st}\, dt = \int_0^{\infty} \sin(at)e^{-st}\, dt$$

$$= \left[\frac{e^{-st}}{a^2+s^2}\left[-s\sin(at) - a\cos(at)\right]\right]_{\infty}^{0}$$

$$= \boxed{\frac{a}{a^2+s^2}}$$

16.] Laplace transform of Cos (at) u (t) is?

Answer :- a

Explanation :- We know that,

$F(s) =$

$$\int_{-\infty}^{\infty} \cos(at)\, u(t)\, e^{-st}\, dt = \int_{0}^{\infty} \cos(at)\, e^{-st}\, dt$$

$$= \left[\frac{e^{-st}}{a^2+s^2}\left[-s\cos(at) - a\sin(at)\right]\right]_{\infty}^{0}$$

$$= \boxed{\frac{a}{a^2+s^2}}$$

Q17] $f(t) = e^t \sin at$, for $0 < t < \pi$ and $f(t) = 0$ for $t > \pi$

Answer :- b

Explanation:- $L[f(t)] = e^t \sin at$

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

$$= \int_0^\pi e^{-st} \times e^t \sin at\, dt + \int_\pi^\infty 0\, dt$$

$$= \int_0^\pi e^{-(s-1)t} \sin at\, dt$$

Formula

OMIT

$$e^{ax} \sin bx dx = \frac{1}{a^2+b^2} e^{ax}[a \sin bx - b \cos bx]$$

$$= \left[\frac{a^2}{(-(s-1))^2 + a^2}\right] \times e^{ax}\left[-(s-1) \sin ax - a \cos ax\right]_0^\pi$$

$$= \boxed{\frac{a^2}{(s-1)^2 + a^2}}$$

18] Laplace transform of $t^2 \sin(2t)$

Answer :- d

Explanation :- We know that,

$$L(t^n f(t)) = (-1)^n \frac{d^n F(s)}{ds^n}$$

Here, $f(t) = \sin(2t) => F(s) = \frac{2}{s^2+4}$

Hence,

$$L(t^2 \sin(2t)) = \frac{d^2}{ds^2}\left(\frac{2}{s^2+4}\right) = \frac{d}{ds} \frac{(s^2+4).0 - 2(2s)}{(s^2+4)^2}$$

$$= -4\left[\frac{(s^2+4)^2 - 2s(s^2+4)2s}{(s^2+4)^4}\right] = \boxed{\left[\frac{12s^2-16}{(s^2+4)^3}\right]}$$

19] Find the laplace transform of $t^{5/2}$.

Answer :- b

Explanation :-

$$g(t) = t^{5/2} = \frac{5}{2}\int_0^t t^{\frac{3}{2}} dt = \frac{15}{4}\int_0^t \int_0^t \sqrt{t}\, dt\, dt$$

let $f(t) = \sqrt{t}$, hence, $F(s) = \frac{\sqrt{\pi}}{2s^{\frac{2}{3}}}$

Hence, $G(s) = \frac{15}{4}\frac{1}{s^2} F(s) = \boxed{\frac{15}{8}\frac{\sqrt{\pi}}{s^{7/2}}}$

20.] Value of $\int_{-\infty}^{\infty} e^{t} \sin(t) \cos(t)\, dt = ?$

Answer:- c

Explanation:-

$$L(\sin(2t)) = \int_{-\infty}^{\infty} e^{-st} \sin(2t)\,dt = 2/(s^2+4)$$

Putting $s = -1$

$$\int_{-\infty}^{\infty} e^{t} \sin(2t)\,dt = 0.4$$

Hence,

$$\int_{-\infty}^{\infty} e^{-st} \sin(t) \cos(t)\,dt = \boxed{0.2}$$

21.] Find the laplace transform of $y(t) = e^{t}.t.\sin(t)\cos(t)$.

Answer:- d

Explanation:- $y(t) = \frac{1}{2} t.e^{t} \sin(2t)$

Laplace transform of $\sin(2t) = \frac{2}{s^2+4}$

Laplace transform of $t\sin(2t) = -\frac{d}{dt}\frac{2}{s^2+4} = \frac{2(2s)}{(s^2+4)^2} = \frac{4s}{(s^2+4)^2}$

Laplace transform of $te^{t} \sin(2t) = \frac{4(s-1)}{[(s-1)^2+4]^2}$

Laplace transform of $1/2\ te^{t} \sin(2t) =$

$$\boxed{\frac{2(s-1)}{[(s-1)^2+4]^2}}$$

22] Find the value of $\int_n^{\infty} t \sin(t) \cos(t)$

Answer:- d

Explanation:- $y(t) = \frac{1}{2} t \sin(2t) u(t)$

Laplace transform of $\sin(2t) = \frac{2}{s^2+4}$

Laplace transform of $t \sin(2t) =$

$$-\frac{d}{dt} \frac{2}{s^2+4} = \frac{2(2s)}{(s^2+4)^2} = \frac{4s}{(s^2+4)^2}.$$

Laplace transform of

$$\frac{1}{2} t \sin(2t) = \int_{-0}^{\infty} e^{-st} t \sin(t) \cos(t)\, dt = \frac{2s}{[s^2+4]^2}$$

Putting, $s=0$, $\int_0^{\infty} t \sin(t) \cos(t)\, dt = \boxed{0}$

23] Find the $L^{-1}\left(\frac{s+3}{4s^2+9}\right)$

Answer:- d

Explanation:- In the given question

$$= \frac{1}{4} L^{-1}\left(\frac{s+3}{s^2+\frac{9}{4}}\right)$$

$$= \frac{1}{4}\left\{L^{-1}\left(\frac{s}{s^2+\frac{9}{4}}\right) + L^{-1}\left(\frac{3}{s^2+\frac{9}{4}}\right)\right\}$$

$$= \frac{1}{4}\left\{\cos\left(\frac{3t}{2}\right) + 2\sin\left(\frac{3t}{2}\right)\right\}$$

$$= \boxed{\frac{1}{4}\cos\left(\frac{3t}{2}\right) + \frac{1}{2}\sin\left(\frac{3t}{2}\right)}$$

24] Find the $L^{-1}(1/(s+2)^4)$

Answer:- C

Explanation:- In the given equestion

$$L^{-1}\left(\frac{1}{(s+2)^4}\right) = e^{-2t} L^{-1} \frac{1}{s^4} \text{ - - - - -}$$

By the first shifting property

$$= e^{-2t} \times \frac{t^3}{3!}$$

$$= \boxed{e^{-2t} \times \frac{t^3}{6}}$$

25] Find the $L^{-1}(s/(s-1)^7)$

Answer:- C

Explanation:- In the given question,

$$= L^{-1}\left(\frac{s-1+1}{(s-1)^7}\right)$$

$$= e^t L^{-1}\left(\frac{s+1}{s^7}\right)$$

$$= e^t L^{-1}\left(\frac{1}{s^7} + \frac{1}{s^6}\right)$$

$$= \boxed{e^t\left(\frac{t^6}{6!} + \frac{t^5}{5!}\right)}$$

26] Find the $L^{-1}\left(\frac{s}{2s+9+s^2}\right)$

Answer:- b

Explanation:- In the given question,

$$L^{-1}\left(\frac{s}{2s+9+s^2}\right) = L^{-1}\left(\frac{s}{(s+1)^2}+8)\right)$$

$$= L^{-1}\left(\frac{(s+1)-1}{(s+1)^2+8}\right)$$

$$= e^{-t} L^{-1}\left(\frac{(s-1)}{s^2+8}\right)$$ ------ By first Shifting Property

$$= e^{-t} L^{-1}\left(\frac{s}{s^2+8}\right) - e^{-t} L^{-1}\left(\frac{1}{s^2+8}\right)$$

$$= \boxed{e^{-t}\{\cos(2\sqrt{2t}) - \sin(2\sqrt{2t}\}}$$

Q27] Find the $L^{-1}\left(\frac{(s+1)}{(s+2)(s+3}\right)$

Answer:- a

Explanation:- In the given question

$$L^{-1}\left(\frac{(s+1)}{(s+2)(s+3)}\right) = L^{-1}\left(\frac{2(s+2)-(s+3)}{(s+2)(s+3}\right)$$

$$= L^{-1}\left(\frac{2}{(s+3)}\right) + L^{-1}\left(\frac{1}{(s+2)}\right)$$

$$= \boxed{2e^{-3t} - e^{-2t}}$$

Q28.] Find the $L^{-1}\left(\frac{(3s+9)}{(s+1)(s-1)(s-2)}\right)$

Answer:- d

Explanation:- In the give question,

$$L^{-1}\left(\frac{(3s+9)}{(s+1)(s-1)(s-2)}\right)$$

$$= L^{-1}\left(\frac{1}{(s+1)}\right) - 6L^{-1}\left(\frac{-6}{(s-1)}\right) + 5L^{-1}\left(\frac{-6}{(s-2)}\right)$$

----- Using properties of partial fractions.

$$= \boxed{e^{-t} - 6e^{t} + 5e^{2t}}$$

Q29. Find the $L^{-1}\left(1/(s^2+4)(s^2+9)\right)$

Answer:- d

Explanation:- In the given question,

$$L^{-1}\left(\frac{1}{(s^2+4)(s^2+9)}\right)$$

$$= \frac{1}{5}L^{-1}\left(\frac{5}{(s^2+4)(s^2+9)}\right)$$

$$= \frac{1}{5}L^{-1}\left(\frac{(s^2+9)-(s^2+4)}{(s^2+4)(s^2+9)}\right)$$

$$= \frac{1}{5}L^{-1}\left(\frac{1}{(s^2+4)}\right) - \frac{1}{5}L^{-1}\left(\frac{1}{(s^2+9)}\right)$$

$$= \boxed{\frac{1}{5}\left(\frac{\sin(2t)}{2} - \frac{\sin(3t)}{3}\right)}$$

30] Find the $L^{-1}\left(\frac{s}{(s^2+1)(s^2+2)(s^2+3)}\right)$

Answer:- c

Explanation:- In the given question

$$L^{-1}\left(\frac{s}{(s^2+1)(s^2+2)(s^2+3)}\right)$$

$$= L^{-1}\left(\frac{\frac{1}{2}}{(s^2+1)} + \frac{(-1)}{(s^2+2)} + \frac{\frac{(-1)}{2}}{(s^2+3)}\right)$$

— By method of Partial fractions

$$= \boxed{\frac{1}{2}\cos(t) - \cos(\sqrt{2t}) - \frac{1}{2}\cos(\sqrt{3t})}$$

31] Find the $L^{-1}\left(\frac{(s+1)}{(s-1)(s+2)^2}\right)$

Answer:- b

Explanation:- In the given fractions -

$$s+1 = A(s+2)^2 + B(s-1)(s+2) + C(s-1)$$

At $s=1$, $A = \frac{2}{9}$

At $s=2$, $C = \frac{1}{3}$

At $s=0$, $B = \frac{-2}{9}$

Resubstituting all these values in the original fraction.

$$= L^{-1}\left(\frac{2}{9(s-1)} + \frac{-2}{9(s+2)} + \frac{1}{3(s+2)^2}\right)$$

$$= \boxed{\frac{2}{9}e^{t} - \frac{2}{9}e^{-2t} + \frac{1}{3}e^{-2t}\times t}$$

32] Find the $L^{-1}(1/s(s^2+4))$.

Answer:- d

Explanation:- In the given question

Let $p_1(s) = \frac{1}{s^2+4}$ and $p_2(s) = \frac{1}{s}$

$$f_1(t) = L^{-1}\left(\frac{1}{s^2+4}\right) = \frac{\sin(2t)}{2}$$

$$f_2(t) = L^{-1}\left(\frac{1}{s}\right) = 1$$

By Convolution Theorem,

$$L^{-1}(p_1(s) \times p_2(s)) = \int_0^t f_1(u) f_2(t-u)\, dt$$

$$L^{-1}\left(\frac{1}{s(s^2+4)}\right) = \int_0^t \frac{1}{2}\sin(2u)\, du$$

$$= \frac{1-\cos(2t)}{4}$$

Q33] Find the $L^{-1}[s/(s^2+4)^2]$

Answer :- C

Explanation :- In the given question

Let $p_1(s) = \frac{1}{s^2+4}$ and $p_2(s) = \frac{1}{s}$

$$f_1(t) = L^{-1}\left(\frac{1}{s^2+4}\right) = \frac{\sin(2t)}{2}$$

$$f_2(t) = L^{-1}\left(\frac{s}{s^2+4}\right) = \cos(2t)$$

By Convolution Theorem,

$$L^{-1}(p_1(s) \times p_2(s)) = \int_0^t f_1(u) f_2(t-u) dt$$

$$L^{-1}\left(\frac{s}{(s^2+4^2)^2}\right) = \int_0^t \sin(2u) \times \frac{1}{2} \times \cos(2(t-u)) du$$

$$= \frac{1}{4}\left[t \sin(2t) - \frac{\cos(2t)}{4} + \frac{\cos(2t)}{4}\right]$$

$$= \frac{1}{4} t \sin(2t)$$

Thus, the correct answer is $\boxed{\frac{1}{4} t \sin(2t)}$

34] Solve the Ordinary Differential Equation by Laplace Transformation $y'' - 2y' - 8y = 0$ if $y(0) = 3$ and $y'(0) = 6$

Answer:- a

Explanation:- $L[y'' - 2y' - 8y] = 0$

$$s^2 Y(s) - sy(0) - y'(0) - 2sY(s) + 2y(0) - 8Y(s) = 0$$

$$(s^2 - 2s - 8) Y(s) = 2s$$

$$L[y(t)] = 2 \frac{s}{(s^2 - 2s - 8)}$$

Therefore, $y(t) = \boxed{3e^t \cos(3t) + t \sin t(3t).}$

Q35] Solve the Ordinary Differential Equation using Laplace Transformation $y''' - 3y'' + 3y' - y = t^2 e^t$ when $y(0) = 1$, $y'(0) = 0$ and $y''(0) = 2$.

Answer:- a

Explanation:- $L[y''' - 3y'' + 3y' - y = t^2 e^t]$

$$s^3 Y(s) - s^2 y(0) - sy'(0) - y''(0) - 3s^2$$

$$Y(s) + 3sy(0) + 3y'(0) + 3sY(s) - 3y(0) - Y(s) = \frac{2}{(s-1)^3}$$

$$Y(s) = \frac{2}{(s-1)^6} + \frac{s^2 + 3s + 5}{(s-1)^3}$$

$$y(t) = \boxed{2e^t \frac{t^5}{720} + e^t + 2e^t \frac{t}{6} + 4e^t \frac{t^2}{24}}$$