**PROF. P.C.THOMAS CLASSES & CHAITHANYA CLASSES**
**KEAM 2020-SOLUTIONS**
**CODE B1-MATHEMATICS**

1. C)

$f(x)=\sqrt{x-1} \Rightarrow x-1\geq 0$

$x\geq 1$

$\Rightarrow [1,\infty)$

2. D)

$f(x)=-2x^2+1,\ g(x)=4x-3$

$(gof)(-1)=g(f(-1))$

$=g(-1)$

$=-7$

3. A)

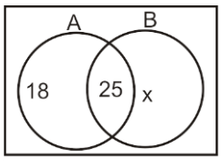
$18+25+x=70$

$x=70-43$

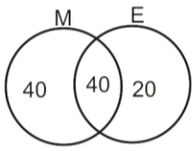
$x=27$

$n(B)=27+25$

$=52$




4. C)




$n(m\cap E)=40$

$n[E \text{ only}]=20$

5. B)

$2*5\frac{2}{5}+\frac{5}{2}+\frac{1}{10}=\frac{4+25+1}{10}=3$

6. C)

$A-B=\{1,3,5\}$

7. B)

$A=\{2,3,4,5\}$

$B=\{36,45,49,60,77,90\}$

$aRb \Rightarrow$ a is a factor of b

8. C)

$z=e^{3x}.e^{4xi}=e^{3x}[\cos 4x+i\sin 4x]$

$Re(z)=e^{3x}\cos 4x$

9. A)

$z=x-iy$

$z^{1/3}=p+iq$

$z=p^3+(iq)^3+3p^2iq+3pi^2q^2$

$x-iy=p^3-3pq^2+i(3p^2q-q^3)$

$x=p[p^2-3q^2]$

$x=p[p^2-3q^2]$

$y=q[q^2-3p^2]$

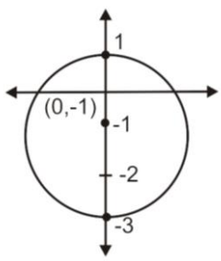
$\frac{x}{p}+\frac{y}{q}=p^2+q^2-3p^2-3q^2$

$\frac{x}{p}+\frac{y}{q}=-2(p^2+q^2)$

$\frac{1}{p^2+q^2}\left(\frac{x}{p}+\frac{y}{q}\right)=-2$

10. A)

$|z--i|=2 \Rightarrow \text{radius}=2,\ \text{centre}=(0,-1)$




11. D)

$\alpha=2+i$

$\beta=2-i$

$\alpha\beta=5=c$

12. C)

$\left|\frac{1}{z_1}+\frac{1}{z_2}\right|=\left|\frac{z_1+z_i}{z_1z_2}\right|=\frac{|z_1+z_2|}{|z_1z_2|}=\frac{3}{4}$

13. D)

$z=\frac{1+i}{1-i}=i \Rightarrow \arg(z)=\frac{\pi}{2}$

14. C)

$z_1=2+3i$

$z_2=3+2i$

$z_1+z_2=5+5i$

$|z_1+z_2|=\sqrt{25+25}=\sqrt{50}=5\sqrt{2}$

15. D)

$\frac{10i}{1+2i}=\frac{10i(1-2i)}{5}=2i(1-2i)=4+2i$

16. E)

$$\sum_1^{10}\left(3k^2+2k-1\right)=3\sum_1^{10}k^2+2\sum_1^{10}-\sum_1^{10}1$$
$$=\frac{3\times10\times1\times21}{6}+\frac{2\times10\times11}{2}-10$$
$$=1155+110-10$$
$$=1255$$

17. C)

$$a_z^2=a_1a_6=a_1\left(a_a+5d\right)$$
$$\left(a_1+d\right)^2=a_1^2+5a_1d$$
$$2a_1d+d^2=5a_1d$$
$$3a_1d-d^2=0$$
$$d\left[3a_1-d\right]=0$$
$$a\neq0\Rightarrow d=3a_1$$

18. E)

$$a+a+2d=6$$
$$2a+2d=6$$
$$a+d=3\quad\ldots(1)$$
$$a+d+a+3d=20$$
$$2a+4d=20$$
$$a+2d=10\ldots.(2)$$
$$d=7,a=-4$$
$$T_{11}=-4+70=66$$

19. A)

$$\frac{n}{2}\left[t_1+t_n\right]=70$$
$$n\left[3+17\right]=140$$
$$n\times20=140$$
$$n=7$$

20. D)

$$\frac{1}{30}+\frac{7}{30}+\frac{11}{30}+\frac{13}{30}+\frac{17}{30}+\frac{19}{30}+\frac{23}{30}+\frac{29}{30}=4$$

21. D)

$$2q=p+23$$
$$p=11\Rightarrow2q=11+23$$
$$q=17$$
$$p+q=11+17=28$$

22. C)

$$ar^4=12$$
$$ar^6=48$$
$$r^2=4\Rightarrow r=2$$
$$ar^8=9r^6\times r^2$$
$$=48\times4$$
$$=192$$

23. A)

$$1\rightarrow10\Rightarrow S$$

Digits are 1, 3, 5, 7,9

$$11\rightarrow99\Rightarrow5\times5=25$$
$$100\rightarrow999\Rightarrow5\times5\times5=125$$

24. D)

Polygons can be triangle or quadrilateral or pentagon

no $={}^5C_3+{}^5C_4+{}^5C_5$

$=10+5+1$

$=16$

25. E)

No. of terms = 21

Middle term $=T_{10+1}={}^{20}C_{10}\left(\frac{1}{5}\right)^{10}$

26. C)

${}^{11}C_0+{}^{11}C_1+\ldots.+{}^{11}C_5=$

$$\frac{1}{2}\left[2\left({}^{11}C_0+{}^{11}C_1+{}^{11}C_2+{}^{11}C_3+{}^{11}C_4+{}^{11}C_5\right)\right]$$
$$=\frac{1}{2}\left[{}^{11}C_0+{}^{11}C_1\ldots\ldots{}^{11}C_{10}+{}^{11}C_{11}\right]$$
$$=\frac{1}{2}\times2^{11}=2^{10}\qquad\boxed{{}^nC_r={}^nC_{n-r}}$$

27. B)

$$\frac{{}^nP_r}{{}^nC_r}=\frac{840}{35}$$
$$r_0'=24$$
$$r=4$$

28. A)

Put $x=1$

$$\left(1+2-1\right)^{20}=2^{20}$$

29. C)

$${}^{10}C_4=\frac{10\times9\times8\times7}{1\times2\times3\times4}=210$$

30. D)

$$B=\begin{bmatrix}62&2\\7&-5\end{bmatrix}-\begin{bmatrix}-2&1\\4&-9\end{bmatrix}$$
$$=\begin{bmatrix}8&1\\3&4\end{bmatrix}$$

31. E)

$$\begin{vmatrix}bc&ca&ab\\a^3&b^3&c^3\\\frac{1}{a}&\frac{1}{b}&\frac{1}{c}\end{vmatrix}=\frac{1}{abc}\begin{vmatrix}abc&abc&abc\\a^4&b^4&c^3\\1&1&1\end{vmatrix}=0$$

32. C)

$$\left(24-2k\right)-2\left(-18+4k\right)-1\left(-6+16\right)=0$$
$$24-2k+36-8k-10=0$$
$$-10k$$
$$50=0$$
$$k=5$$

33. B)

Second Raw $\times1^{st}$ column

34. D)

$$A=\begin{bmatrix}3&4\\5&3\end{bmatrix}\Rightarrow A^{-1}=\frac{1}{9-20}\begin{bmatrix}3&-4\\-5&3\end{bmatrix}$$
$$=\frac{1}{-11}\begin{bmatrix}3&-4\\-5&3\end{bmatrix}$$
$$=\frac{1}{11}\begin{bmatrix}-3&4\\5&-3\end{bmatrix}$$

35. A)

$x+y+2z=14 \quad ....(1)$

$3x+3y+6z=17....(2)$

$(1)\times 3 \Rightarrow 2x+3y+6z=12.....(3)$

$(2)-(3) \Rightarrow \qquad 0=5$

Not possible

36. C)

$n=2,3,$ fails

$n=5 \Rightarrow \dfrac{2\times 5-3}{3} \geq \dfrac{4}{6}+1 \qquad \dfrac{1}{3}>\dfrac{1}{6}+1$

$\dfrac{7}{3} \geq \dfrac{2}{3}+1 \qquad \dfrac{7}{3} \geq \dfrac{4}{6}+1$

$1+\dfrac{4}{3}>\dfrac{2}{3}+1 \qquad 1+\dfrac{4}{3}>\dfrac{2}{3}+1$

Which is true

37. A)

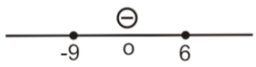
$\left|n^2-100\right|<50$

$-50<n^2-100<50$

$50<n^2<150$

$n=8,9,10,11,12$

38. D)




$[-9,6)$

39. B)

40. B)

$\sin^2\theta+\cos^2\theta+\cos^2\theta=\dfrac{7}{4}$

$\cos^2\theta=\dfrac{7}{4}-1=\dfrac{3}{4}$

$\cos\theta=\dfrac{\sqrt{3}}{2} \Rightarrow \theta=30^\circ$

41. C)

$\left(\sin^2 1+\sin^2 89\right)+\left(\sin^2 2+\sin^2 88\right)+$

$....+\left(\sin 44+\sin^2 46\right)+\sin^2 45$

$1+1+....+1+\dfrac{1}{2}$

$=44+\dfrac{1}{2}$

$=\dfrac{89}{2}$

42. B)

$\dfrac{\pi}{2}-\dfrac{\pi}{8}=\dfrac{3\pi}{8} \Rightarrow \sin\dfrac{3\pi}{8}=\cos\dfrac{\pi}{8}$

$\sin\dfrac{4\pi}{8}+\cos^4\dfrac{\pi}{8}=\left(\sin^2\dfrac{\pi}{8}+\cos^2\dfrac{\pi}{8}\right)^2-2\sin\dfrac{\pi}{8}\cos^2\dfrac{\pi}{8}$

$=1-\dfrac{1}{2}\left(2\sin\dfrac{\pi}{8}\cos\dfrac{\pi}{8}\right)$

$=1-\dfrac{1}{2}.\sin^2\dfrac{\pi}{4}=1-\dfrac{1}{2}\times\dfrac{1}{2}=1-\dfrac{1}{4}=\dfrac{3}{4}$

43. E)

$\sin\left(45^\circ+\theta\right)=\dfrac{1}{\sqrt{2}}\cos\theta+\dfrac{1}{\sqrt{2}}\sin\theta$

$\cos\left(45-\theta\right)=\dfrac{1}{\sqrt{2}}\cos\theta+\dfrac{1}{\sqrt{2}}\sin\theta$

$\sin\left(45+\theta\right)-\cos\left(45-\theta\right)=0$

44. A)

$2\cos^2 x-1=\cos x$

$2\cos^2 x-\cos x-1=0$

$\left(2\cos x+1\right)\left(\cos x-1\right)=0$

$\cos x=\dfrac{-1}{2},\cos x=1$

$0,\dfrac{2\pi}{3}$

$-2+1$

$2x^2-2x+x-1$

$2x\left(x-1\right)+\left(x-1\right)$

$\left(x-1\right)\left(2x+1\right)$

45. B)

$10\tan\left[\tan^{-1}\dfrac{1}{3}+\tan^{-1}\dfrac{1}{7}\right]$

$=10\tan\left[\tan^{-1}\left(\dfrac{\frac{1}{3}+\frac{1}{7}}{1-\frac{1}{3}\times\frac{1}{7}}\right)\right]$

$=10\tan\ \tan^{-2}\left(\dfrac{10}{20}\right)$

$=10\times\dfrac{1}{2}=5$

46. E)

$\tan x+\tan y=\dfrac{5}{6},\ \cot x+\cot 9=5$

$\dfrac{1}{\tan x}+\dfrac{1}{\tan y}=5$

$\dfrac{\tan x+\tan y}{\tan x\tan y}=5$

$\dfrac{5}{6\times 5}=\tan x\tan y$

$\tan x\tan y=\dfrac{1}{6}$

$\tan\left(x+y\right)=\dfrac{\tan x+\tan y}{1-\tan x.\tan y}$

$=\dfrac{\frac{5}{6}}{1-\frac{1}{6}}=1$

47. A)

$\dfrac{\sin 91+\sin 1}{\sin 91-\sin 1}=\dfrac{\cos 1+\sin 1}{\cos 1-\sin 1}$

$=\dfrac{1+\tan 1}{1-\tan 1}$

$=\tan\left(45+1\right)$

$=\tan 46$

48. D)

$$\cos\left[\frac{\pi}{2}+\sin^{-1}\frac{1}{5}\right]$$

$$-\sin\sin^{-1}\frac{1}{5}$$

$$=-\frac{1}{5}$$

49. B) y=7

50. Out (1,5) in 2 equations

$$5=m+2\Rightarrow m+3$$

also $5=a+5-2\Rightarrow a=2$

$$a+m=5$$

51. E)

$$\frac{2a-5}{9-7}=\frac{25}{5}=5$$

$$2a-5=5a-35$$

$$30=39\Rightarrow 9=10$$

52. C)

$$\frac{4}{6}=\frac{6}{k}$$

$$k=9$$

53. A)

$$y=x+C$$

$$y=2x-4$$

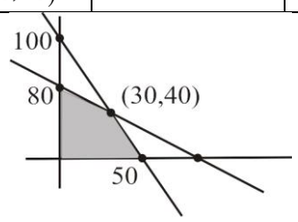
$$\underline{2y=2x+2C}$$

$$y=2C+4\Rightarrow 2=2C+4\Rightarrow 2C=-2$$

$$C=-1$$

54. D)Vertices $z=7x+5.4$

| | | |
|---|---|---|
| $(50,0)$ | $7\times50+0$ | 350 |
| $(0,80)$ | $0+400$ | 400 |
| $(30,40)$ | $210+200$ | 410 |




55. E)

$$r^2=4^2+5^2=41$$

$$(x-3)^2+(y-6)^2=41$$

$$x^2+y^2-6x-12y+4=0$$

56. C)

$$x^2+y^2-5x+2y=0$$

$$(-y,-f)=(2,-1)$$

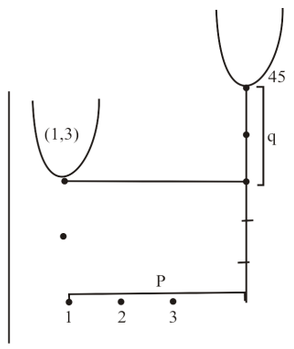
$$r=\sqrt{2^2+1^2}=\sqrt{5}$$

57. B) Centre $=(4-3)$ $r=\sqrt{7}$

$$(x-4)^2+(y+3)^2=7$$

$$x^2+y^2-8x+6y+18=0$$

58. D)




$$y=x^2-2x+1+3$$

$$=(x-1)^2+3$$

$$p=3,$$

$$q=2$$

59. B)

$$y=x^2-10x+16+7$$

$$y=x^2-10x+23$$

$$y=x^2-10x+25-2$$

$$y=(x-5)^2-2$$

$$(5,-2)$$

60. C)

$$400x^2+100y^2=40000$$

$$4x^2+y^2=400$$

$$\frac{x^2}{100}+\frac{y^2}{400}=1$$

$$\frac{x^2}{10^2}+\frac{y^2}{20^2}=1$$

$$a=20,\ b=10$$

$$2a=40,\ 2b=20$$

61. D)

$$\frac{x^2}{1^2}+\frac{y^2}{2^2}=1$$

$$a^2=4, b^2=1$$

$$e=\sqrt{1-\frac{b^2}{a^2}}=\sqrt{1-\frac{1}{4}}=\frac{\sqrt{3}}{2}$$

62. E) $\frac{x^2}{2}-\frac{y^2}{3}=1$

$$\frac{2b^2}{a}=\frac{2\times3}{\sqrt{2}}=3\sqrt{2}$$

63. B)

$$|\vec{u}\times\vec{v}|^2=|\vec{u}|^2|\vec{v}|^2.\sin^2 v$$

$$|\vec{u}.\vec{v}|^2=|\vec{u}|^2|\vec{v}|^2\cos^2 v$$

$$|\vec{u}\times\vec{v}|^2+|\vec{u}|^2|\vec{v}|^2=|\vec{u}|^2.|\vec{v}|^2$$

$$14\times45$$

$$=630$$

64. B)

$$|\vec{a}|=\sqrt{1+25+64}=\sqrt{90}=3\sqrt{10}$$

$$de=<\frac{1}{3510},\frac{-5}{3\sqrt{10}},\frac{8}{3\sqrt{10}}>$$

65. B)

$$\cos\theta = \frac{2+3-1}{\sqrt{3}\sqrt{14}} = \frac{4}{\sqrt{42}}$$

$$\tan\theta = \frac{\sqrt{26}}{4}$$

66. D)

$$\perp r \Rightarrow \vec{a}.\vec{b} = 0$$

$$6 - 2\lambda = 0 \Rightarrow \lambda = 3$$

67. E)

$$\sqrt{a^2 + (\alpha+1)^2 + 4} = 3$$

$$2a^2 + 2a + 5 = 9$$

$$2a^2 + 2a - 4 = 0$$

$$a^2 + a - 2 = 0$$

$$(\alpha+2)(\alpha-1) = 0$$

$$\alpha = -2, 1$$

68. D)

$$(\vec{a}+\vec{b}).(\vec{a}-\vec{b}) = |\vec{a}|^2 - |\vec{b}|^2$$

$$= 17 - 6$$

$$= 11$$

69. E)

$$\frac{\vec{a}.\vec{b}}{|\vec{b}|} = \frac{\vec{b}.\vec{a}}{|\vec{a}|} \Rightarrow |\vec{a}| = |\vec{b}|$$

$$\Rightarrow 1 + 4 + 9 = \lambda^2 + 9$$

$$\Rightarrow \lambda^2 = 5$$

$$\Rightarrow \lambda = \mp\sqrt{5}$$

70. A)

$$\left[\vec{a}-\vec{b}\right]^2 = |\vec{a}|^2 - |\vec{b}|^2 - 2\vec{a}.\vec{b}$$

$$= 4 + 9 - 2\times 4$$

$$= 5$$

$$\left[\vec{a}-\vec{b}\right] = \sqrt{5}$$

71. D) Substituting

$$(3,3,0) \Rightarrow \frac{3-1}{2} = 1$$

$$\frac{3+1}{4} = 1$$

$$\frac{0-2}{-2} = 1$$

72. B)

$$\vec{r}, \vec{n} = \vec{a}.\vec{r}$$

$$\left(x\hat{i} + y\hat{j} + 8\hat{k}\right).\left(\hat{i}+\hat{j}+\hat{k}\right) = \left(\hat{j}+\hat{k}\right)\left(\hat{i}+\hat{j}+\hat{k}\right)$$

$$x + 9 + z = 2$$

73. C)

$$PM = \left|\frac{6\times 4 + 2\times 2 - 3\times 9 - 46}{\sqrt{6^2 + 2^2 - 9^2}}\right|$$

$$= \left|\frac{24 + 4 - 27 - 46}{11}\right|$$

$$= \frac{45}{11}$$

74. C) $3x + y + 2z = 18$

$$\frac{x}{6} + \frac{y}{18} + \frac{z}{9} = 1$$

$$a + b + c = 6 + 18 + 9 = 33$$

75. A) At xy plane, z = 0 (Using parametric equation)

$$z = 4\lambda - 3 = 0 \Rightarrow \lambda = \frac{3}{4}$$

$$x = \lambda + 2 = \frac{3}{4} + 2 = \frac{11}{4}$$

$$y = -5\lambda + 4 = \frac{-15}{4} + 4 = \frac{1}{4}$$

76. D)

$dr = <6,1,3>$, only D satisfy

77. A)

$$\text{Cos}\,\theta = \frac{\bar{a}.\bar{b}}{|a|.|b|} = \frac{1-2+3}{\sqrt{3}\,\sqrt{14}}$$

$$= \frac{2}{\sqrt{42}}$$

78. E)

$$\pi_1 + \lambda\pi_2 = 0$$

$$(x + 2y - z - 3) + \lambda(x + 4 - 3z - 5) = 0,$$

$$p * (1-1,0)$$

$$(1 - 2 - 3) + \lambda(1 - 1 - 5) = 0$$

$$-4 - 5\lambda = 0 \quad \lambda = \frac{4}{5}$$

$$(x + 2y - z - 3) - \frac{4}{5}(x + 4 - 3z - 5) = 0$$

$$x + 6y + 7z + 5 = 0$$

79. D)

$$\frac{\sum x}{30} = 80 \Rightarrow \sum x = 2400$$

$$\frac{\sum x - (x_1 + x_2)}{28} = 82$$

$$2400 - (x_1 + x_2) = 82\times 28$$

$$x_1 + x_2 = 2400 - 2296$$

$$x_1 + x_2 = 104$$

$$\frac{x_1 + x_2}{2} = 52$$

80. A)

$$S = \{2,3,5,7,11,13\}$$

Sum is a prime no.

Favourable easer are

(2,3),(3,2),(2,5),(9,2),(2,11), (11,2)

$$\therefore P = \frac{6}{36} = \frac{1}{6}$$

81. E)

$$A = \{1,2,3,4,5\}$$

$$n(s) = S_{C_3} = 10$$

$$AP: d = 1 \Rightarrow 3\text{cases}(1,2,3)(2,3,4)(3,4,5)$$

$$d = 2 \Rightarrow 1\text{ case}, (1,3,5)$$

$$P = \frac{4}{10} = \frac{2}{5}$$

82. C) Let total no - 100

$$n_1 = 20, \bar{x}_1 = 70, n_2 = 40, \bar{x}_2 = 80$$

$$n_3 = 30, \bar{x}_3 = 90, n_4 = 10, \bar{x}_4 = 100$$

$$\bar{x}=\frac{n_1\bar{x}_1+n_2\bar{x}_2+n_3\bar{x}_3+n_4\bar{x}_4}{n_1+n_2+n_3+n_4}$$
$$=\frac{1400+3200+2700+1000}{100}$$
$$=83$$

83. B)
$$P(A\cup B)=P(A)+P(B)$$
$$P(B)=(A\cup B)-P(A)$$
$$=0.75-0.5$$
$$=0.25$$

84. B)
$$P(R)=\frac{n(R)}{n(S)}=\frac{3}{20}$$

85. E)
$$\sum P(X)=1\Rightarrow 15a=1\Rightarrow a=\frac{1}{15}$$

$$E(X)=\sum xi\,pi=-a+0+3a+8a+15a$$
$$=25a$$
$$=\frac{25}{15}=\frac{5}{3}$$

86. B)
$$-2\le x\le 1\Rightarrow f(x)=x^2-2x$$
$$f(-1)=1+2=3$$

87. A)
$$\frac{dy}{dx}=\frac{2x-y}{x+2y}=\frac{2-\frac{y}{x}}{1+2\frac{y}{x}}\qquad y=vx$$
$$V+x\frac{dV}{dx}=\frac{2-V}{1+2V}$$
$$\frac{xdV}{dx}=\frac{2-V}{1+2V}-V=\frac{2-V-V(1+2V)}{1+2V}$$
$$x\frac{dV}{dx}=\frac{2-V-V-2V^2}{1+2V}=\frac{2(1-v-v^2)}{1+2v}$$
$$x\frac{dV}{dx}=\frac{-2[V^2+V-1]}{2V+1}$$
$$\frac{(2V+1)dV}{V^2+V-1}=\frac{-2dx}{x}$$
$$\log(V^2+V-1)=-2\log x+\log C$$
$$\log\left(\frac{y^2}{x^2}+\frac{y}{x}-1\right)=\log\frac{C}{x^2}+$$
$$\frac{y^2+xy-x^2}{x^2}=\frac{C}{x^2}$$
$$x^2-y^2-xy=C$$

88. E)
$$\lim_{x\to 3}\frac{e^{x-3}-x+1}{x^2-\log(x-2)}=\frac{e^0-3+1}{9-\log 1}=\frac{2-3}{9}=\frac{-1}{9}$$

89. E)
$$\lim_{x\to 4}\frac{\sqrt{x^2+9}-5}{x-4}=\lim_{x\to 4}\frac{1\times 2x}{2\sqrt{x^2+9}}$$
$$=\frac{4}{5}$$

90. D) LHL = RHL
$\Rightarrow$ 4C + 4 = 8
$\Rightarrow$ 4C = 4
$\Rightarrow$ C = 1

91. A)
$$\lim_{x\to 0}\frac{x^{100}.\sin 7x}{(\sin x)^{100}.\sin x}$$
$$\lim_{x\to 0}\frac{\frac{\sin 7x}{7x}\times 7x}{\frac{\sin x}{x}.x}=7$$

92. B)
$$f(x)=\frac{5}{2}x^2-e^x$$
$$f'(x)=2\times\frac{5}{2}x=e^x$$
$$f''(x)=5-e^x$$
$$f''(x)=0\Rightarrow e^x=S\Rightarrow x=\log 5$$

93. E)
$$y=(\cos x)^{2x}$$
$$\log y=2x\log(\cos x)$$
$$\frac{1}{y}.\frac{dy}{dx}=\frac{2x(-\sin x)}{\cos x}+\log\cos x.2$$
$$\frac{dy}{dx}=2(\cos x)^{2x}[\log\cos x-x\tan x]$$

94. A)
$$x^3+2xy+\frac{y^3}{3}=\frac{11}{3}$$
$$3x^2+2xy'+y\times 2+\frac{3y^2}{3}y'=0,\ x=2,y_2-1$$
$$12+4y'-2+y'=0$$
$$5y'+10=0$$
$$y'=-2$$

95. C)
$$x>3\Rightarrow f(x)=5-2x$$
$$f'(x)=-2\Rightarrow f'(6)=-2$$

96. E) $F(x)=(f(g(x))^2$
$$F'(x)=2f(g(x)).f'(g(x)).g'(x)$$
$$F'(1)=2f(2).f'(2).3$$
$$=2\times 4\times 5\times 3=120$$

97. C) $y=2+\sqrt{u}$
$$\frac{dy}{dx}=\frac{1}{2\sqrt{u}}\times\frac{du}{dx},\qquad \frac{dy}{dx}=3x^2$$
$$=\frac{3x^2}{2\sqrt{x^3+1}}$$

98. B)
$$y=-2x^2+3$$
$$\frac{dy}{dx}=-4x\Rightarrow m=-4$$
$$x=1\Rightarrow y=1\Rightarrow(x_1y_1)=(1,1)$$
Eqn. of tangent
$$(y-1)=-4(x-1)$$
$$y-1=-4x+4$$
$$y=-4x+5$$

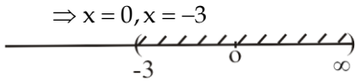
99. C)

$f(x)=x^3e^x$

$f'(x)=e^x\left[x^3+3x^2\right]$

$f'(x)=0\Rightarrow x^2(x+3)=0$

$\Rightarrow x=0,x=-3$




$(-3,\infty)$

100.B)

L.M.V.T

$f'(c)=\dfrac{f(b)-f(a)}{b-a}$

$\dfrac{1}{2\sqrt{c}}=\dfrac{4-2}{16-4}=\dfrac{2}{12}=\dfrac{1}{6}$

$2\sqrt{c}=6$

$\sqrt{c}=3$

$c=9$

101.E)

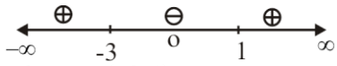
$f(x)=\left(x^2-3\right)e^x$

$f'(x)=e^x\left[x^2-3+2x\right]$

$f'(x)=0\Rightarrow x^2+2x-3=0$

$\Rightarrow (x+3)(x-1)=0$

$\Rightarrow x=-3,1$




$f'(x)<0\Rightarrow x\in(-3,1)$

102.A)

$y=\dfrac{2}{x^2}\quad x=1\Rightarrow y=2$

$\dfrac{dy}{dx}=\dfrac{-4}{x^3},m,=-4\Rightarrow m_2=\dfrac{1}{4}$

$y-2=\dfrac{1}{4}(x-1)$

$4y-8=x-1$

$x-4y+7=0$

103.C)

$f(x)=x^2-x$

$f'(x)=2x-1$

$f'(x)=0\Rightarrow x=\dfrac{1}{2}$

$f\left(\dfrac{1}{2}\right)==\dfrac{1}{4}-\dfrac{1}{2}=\dfrac{-1}{4}$

104.A)

$\int 3x^2\left(x^3+1\right)^{10}dx=\int t^{10}dt,\quad t=\left(x^3+1\right)$

$-\dfrac{t^{11}}{11}+C$

$=\dfrac{\left(x^3+1\right)^{11}}{11}+C$

105.E)

$\int\dfrac{2x+\sin 2x}{1+\cos 2x}dx=\int\dfrac{2x+2\sin x\cos x}{2\cos^2 x}dx$

$=\int\left(x\sec^2 x+\tan x\right)dx$

$=\int d(x\tan x)$

$=x\tan x+C$

106.D) $\int\dfrac{1}{x^2-5^2}dx=\dfrac{1}{2\times 5}\log\left|\dfrac{x-5}{x+5}\right|+C$

107.A) $\int\dfrac{\left(\frac{1}{x}\right)}{\log x}dx=\log|\log x|+C$

108.E)

$\int e^x[\sec x+\sec x\tan x]dx$

$=e^x\sec x+c$

109.D)

$\int\dfrac{dx}{\sqrt{x}\left(1+\sqrt{x}\right)}\qquad t=1+\sqrt{x}$

$dt=\dfrac{1}{2\sqrt{x}}dx$

$=\int\dfrac{2dt}{t}$

$=2\log|t|+c$

$=2\log\left|1+\sqrt{x}\right|+c$

110.A)

$\int\sec^2(5x-1)dx=\dfrac{\tan(5x-1)}{5}$

111.B)

$I=\int_0^{\pi/2}\dfrac{1}{1+\dfrac{\cos^4 x}{\sin^4 x}}dx$

$=\int_0^{\pi/2}\dfrac{\sin^4 x}{\sin^4 x+\cos^4 x}dx=\dfrac{\pi}{4}$

112.B)

$\int_{-a}^{a}f(x)dx=0\quad$ if f(x) is odd

$x^3$ and x are odd function

$\therefore\int_{-10}^{10}20dx=20[x]_{-10}^{10}=20\times 20=400$

113.D)

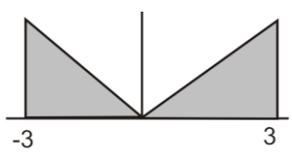
$\dfrac{x}{3}=\cos\theta$

$\dfrac{y}{2}=\sin\theta$

$\dfrac{x^2}{9}+\dfrac{y^2}{4}=1\Rightarrow$ (curve is ellipse in first and 2nd quadrant)

area $=\dfrac{\pi ab}{2}=\dfrac{\pi+3\times 2}{2}=3\pi$

114.D)




y= | x |

Area $=2\times\dfrac{1}{2}\times 3\times 3=9$

115. B)

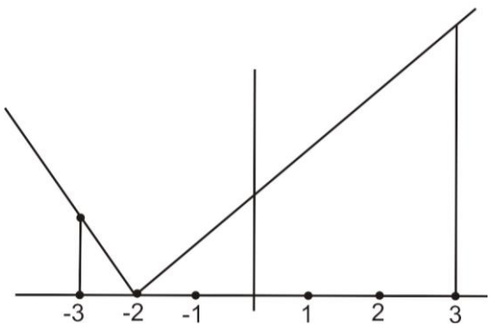
$$\int_e^{e^2} \frac{1}{x}dx = \left[\log(x)\right]_e^{e^2}$$

$$= \log e^2 - \log e$$

$$= 2 - 1$$

$$= 1$$

116.D)




$$\int_{-3}^{3} |x+2|dx$$

$$\text{area} = \frac{1}{2} + \frac{25}{2} = 13$$

117.A)

$$\text{Order } 2,\ \text{deg ree} = 4$$

$$\frac{d^2y}{dx^2} = -\sqrt{x^2 + \left(\frac{dy}{dx}\right)^{3/2}}$$

$$\left(\frac{d^2y}{dx^2}\right)^2 = x^2 + \left(\frac{dy}{dx}\right)^{3/2}$$

$$\left[\left(\frac{d^2y}{dx^2}\right)^2 - x^2\right]^2 = \left(\frac{dy}{dx}\right)^3$$

118.E)

$$\frac{dy}{dx} + \frac{y}{x} = x$$

$$\text{I.F} = e^{\int \frac{1}{x}dx} = e^{\log x} = x$$

$$yx = \int x.x.dx$$

$$yx = \frac{x^3}{3} + C$$

$$y = \frac{x^2}{3} + \frac{c}{x}$$

119.C)

$$y' - \frac{1}{3x}y = \frac{1+\log x}{3x}$$

$$\text{I.F} = e^{\int -\frac{1}{3x}dx} = e^{-\frac{1}{3}\log x}$$

$$= e^{\log x^{\frac{-1}{3}}}$$

$$= x^{-1/3}$$

120.A)

$$y = \frac{A}{x} + B$$

$$y' = \frac{-A}{x^2}$$

$$y'x^2 = -A$$

$x^2y'' + y'2x = 0$ Dividing by x

$$x\frac{d^2y}{dx^2} + 2\frac{dy}{dx} = 0$$

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