ELEMENTARY

1. If $\int_1^x \frac{dt}{|t|\sqrt{t^2-1}} = \frac{\pi}{6}$, then x can be equal to

(A) $\frac{2}{\sqrt{3}}$ (B) $\sqrt{3}$ (C) 2 (D) None of these

2. $\int_0^{(\pi/2)^{1/3}} x^5 \cdot \sin x^3 dx$ equals to

(A) 1 (B) 1/2 (C) 2 (D) 1/3

3. If $A = \int_0^{\pi} \frac{\cos x}{(x+2)^2} dx$, then $\int_0^{\pi/2} \frac{\sin 2x}{x+1} dx$ is equal

(A) $\frac{1}{2} + \frac{1}{\pi+2} - A$ (B) $\frac{1}{\pi+2} - A$ (C) $1 + \frac{1}{\pi+2} - A$ (D) $A - \frac{1}{2} - \frac{1}{\pi+2}$

4. If $f(\pi) = 2$ and $\int_0^{\pi} (f(x) + f''(x))\sin x dx = 5$ then f(0) is equal to (It is given that f(x) is continuous in $[0, \pi]$)

(A) 7 (B) 3 (C) 5 (D) 1

5. If $x \in (0,2)$ then the value of $\int^{1} e^{2x-[2x]} d(x-[x])$ is (where [*] denotes the grealest integer function)

(A) $e+1$ (B) e (C) $2e-2$ (D) $e-1$

6. $\int_{\log\pi-\log 2}^{\log\pi} \frac{e^x}{1-\cos\left(\frac{2}{3}e^x\right)} dx$ is equal to

(A) $\sqrt{3}$ (B) $-\sqrt{3}$ (C) $\frac{1}{\sqrt{3}}$ (D) $-\frac{1}{\sqrt{3}}$

7. If $\int_0^{\infty} e^{-x^2} dx = \frac{\sqrt{\pi}}{2}$, then $\int_0^{\infty} e^{-ax^2} dx$ where $a > 0$ is

(A) $\frac{\sqrt{\pi}}{2}$ (B) $\frac{\sqrt{\pi}}{2a}$ (C) $2\frac{\sqrt{\pi}}{a}$ (D) $\frac{1}{2}\sqrt{\frac{\pi}{a}}$

8. Let $A = \int_0^1 \frac{e^t dt}{1+t}$ dt then $\int_{a-1}^{a} \frac{e^{-t}}{t-a-1}$ dt has the value

(A) Ae^{-a} (B) $-Ae^{-a}$ (C) $-ae^{-a}$ (D) Ae^{a}

9. Let $\frac{d}{dx}F(x) = \left(\frac{e^{\sin x}}{x}\right)$, $x > 0$, If $\int_1^4 \frac{3}{x} e^{\sin x^3} dx = F(k) - F(1)$, then one of the possible values of k, is

(A) 15 (B) 16 (C) 63 (D) 64

10. $\frac{1}{c}\int_{ac}^{bc} f\left(\frac{x}{c}\right) dx =$

(A) $\frac{1}{c}\int_a^b f(x)dx$ (B) $\int_a^b f(x)dx$ (C) $c\int_a^b f(x)dx$ (D) $\int_{ac^2}^{bc^2} f(x)dx$

11. $\int_{5/2}^{5} \frac{\sqrt{(25-x^2)^3}}{x^4} dx$ equals to

(A) $\frac{\pi}{3}$ (B) $\frac{2\pi}{3}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{2}$

12. The value of $\int_0^{[x]}\{x\}dx$ is

(A) $\frac{1}{2}[x]$ (B) $2[x]$ (C) $\frac{1}{2[x]}$ (D) $[x]$

13. The value of $\int_0^{\pi/4}(\tan^n x+\tan^{n-2}x)d\left(x-\frac{[x]}{1!}+\frac{[x]^2}{2!}-\frac{[x]^3}{3!}+\cdots\right)$, where $[x]$ is greatest integral function, is

(A) $\frac{1}{n}$ (B) $\frac{1}{n+2}$ (C) $\frac{1}{n-1}$ (D) $\frac{1}{n-2}$

14. If $I=\int_0^1\frac{dx}{1+x^{\pi/2}}$, then

(A) $I>\ln 2$ (B) $I<\ln 2$ (C) $I<\pi/4$ (D) $I>\pi/4$

PROPERTY-01

15. The value of integral $\int_a^b\frac{|x|}{x}dx$, $a<b$ is

(A) $b-a$ if $a>0$ (B) $a-b$ if $b<0$

(C) $b+a$ if $a<0<b$ (D) $|b|-|a|$

PROPERTY-02

16. The value of the integral $I=\int_0^1 x(1-x)^n dx$ is -

(A) $\frac{1}{n+1}+\frac{1}{n+2}$ (B) $\frac{1}{n+1}$ (C) $\frac{1}{n+2}$ (D) $\frac{1}{n+1}-\frac{1}{n+2}$

17. Let $I_1=\int_0^1\frac{e^x dx}{1+x}$ and $I_2=\int_0^1\frac{x^2 dx}{e^{x^3}(2-x^3)}$, then $\frac{I_1}{I_2}$ is to

(A) $3/e$ (B) $e/3$ (C) $3e$ (D) $1/3e$

18. If $f(x)$ is a function satisfying $f\left(\frac{1}{x}\right)+x^2f(x)=0$ for all non-zero x, then $\int_{\sin\theta}^{\operatorname{cosec}\theta}f(x)dx$ equals

(A) $\sin\theta+\operatorname{cosec}\theta$ (B) $\sin^2\theta$ (C) $\operatorname{cosec}^2\theta$ (D) 0

PROPERTY-03

19. If $\int_0^{100}f(x)dx=a$, then $\sum_{r=1}^{100}\left(\int_0^1 f(r-1+x)dx\right)=$

(A) $100a$ (B) a (C) 0 (D) $10a$

20. If $f(x)=\begin{cases}x & ;x<1\\ x-1; & x\geq 1\end{cases}$, then $\int_0^2 x^2 f(x)dx$ is equal to

(A) 1 (B) $\frac{4}{3}$ (C) $\frac{5}{2}$ (D) $\frac{5}{3}$

21. Suppose for every integer n, $\int_n^{n+1}f(x)dx=n^2$. The value of $\int_{-2}^4 f(x)dx$ is

(A) 16 (B) 14 (C) 19 (D) 21

22. $\int_0^{\pi}|1+2\cos x|dx$ equals to:

(A) $\frac{2\pi}{3}$ (B) π (C) 2 (D) $\frac{\pi}{3}+2\sqrt{3}$

23. The value of $\int_{-1}^{3}(|x-2|+[x])dx$ is equal to (where [*] denotes greatest integer function)

(A) 7 (B) 5 (C) 4 (D) 3

24. If $\int_{-1}^{3/2}|x\sin\pi x|dx=\frac{k}{\pi^2}$, then the value of k is

(A) $3\pi+1$ (B) $2\pi+1$ (C) 1 (D) 4

25. $\int_{\pi}^{10\pi}|\sin x|dx=$

(A) 9 (B) 10 (C) 18 (D) 20

26. The value of $\int_{-2}^{3}|1-x^2|dx$ is-

(A) 28/3 (B) 14/3 (C) 7/3 (D) 1/3

27. $\int_{0}^{\infty}[2e^{-x}]dx$ is equal to (where [∗] denotes the greatest integer function)

(A) 0 (B) ln2 (C) e^2 (D) $2e^{-1}$

28. $\int_{0}^{\sqrt{2}}[x^2]dx=$

(A) $\sqrt{2}-1$ (B) $2(\sqrt{2}-1)$ (C) $\sqrt{2}$ (D) $5-\sqrt{3}-\sqrt{2}$

29. If $f(x)=\int_{0}^{x}\sin[2x]dx$ then $f(\pi/2)$ is (where [∗] denotes greatest integer function)

(A) $\frac{1}{2}\{\sin 1+(\pi-2)\sin 2\}$ (B) $\frac{1}{2}\{\sin 1+\sin 2+(\pi-3)\sin 3\}$

(C) 0 (D) $\sin 1+\left(\frac{\pi}{2}-2\right)\sin 2$

30. $f(x)=\text{Minimum}\{\tan x,\cot x\}\forall x\in\left(0,\frac{\pi}{2}\right)$.

Then $\int_{0}^{\pi/3}f(x)dx$ is equal to

(A) $\ln\left(\frac{\sqrt{3}}{2}\right)$ (B) $\ln\left(\sqrt{\frac{3}{2}}\right)$ (C) $\ln(\sqrt{2})$ (D) $\ln(\sqrt{3})$

31. The value of $\int_{1}^{2}([x^2]-[x]^2)dx$ is equal to (where [∗] denotes the greatest integer function)

(A) $4+\sqrt{2}-\sqrt{3}$ (B) $4-\sqrt{2}+\sqrt{3}$ (C) $4-\sqrt{3}-\sqrt{2}$ (D) $4+\sqrt{2}+\sqrt{3}$

32. If $f(x)=\begin{cases}e^{\cos x}\sin x, & |x|\le 2\\ 2 & \text{, otherwise}\end{cases}$ then $\int_{-2}^{3}f(x)dx=$

(A) 0 (B) 1 (C) 2 (D) 3

33. The value of $\int_{0}^{\pi/3}[\sqrt{3}\tan x]dx$ (where [∗] denotes the greatest integer function)

(A) $\frac{5\pi}{6}$ (B) $\frac{5\pi}{6}-\tan^{-1}\left(\frac{2}{\sqrt{3}}\right)$ (C) $\frac{\pi}{2}-\tan^{-1}\left(\frac{2}{\sqrt{3}}\right)$ (D) $\frac{\pi}{2}+\tan^{-1}\left(\frac{2}{\sqrt{3}}\right)$

34. The value of $\int_{-2}^{1}\left[x\left[1+\cos\left(\frac{\pi x}{2}\right)\right]+1\right]dx$ is (where [∗] denotes the greatest integer function)

(A) 1 (B) 1/2 (C) 2 (D) 3

35. $\int_0^2 x^3\left[1+\cos\frac{\pi x}{2}\right]dx$ is (where [*] denotes the greatest integer function)

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$ (C) 0 (D) $\frac{1}{3}$

36. $\int_0^{2n\pi}\left(|\sin x|-\left[\left|\frac{\sin x}{2}\right|\right]\right)dx$ is equal to (where [*] denotes the greatest integer function)

(A) 0 (B) 2n (C) $2n\pi$ (D) 4n

37. The value of $\int_{-1}^{3}\{|x-2|+[x]\}dx$ is p, then $\frac{p}{2}$ is equal to (where [x] stands for greatest integer less than or equal to x), is

PROPERTY-04

38. Let $f(x)=\text{minimum}(|x|,1-|x|,1/4),\forall x\in R$, then the value of $\int_{-1}^{1}f(x)dx$ is equal to

(A) $\frac{1}{32}$ (B) $\frac{3}{16}$ (C) $\frac{4}{32}$ (D) $\frac{3}{8}$

39. If [x] denotes the greatest integer less than or equal to x, then the value of $\int_1^5[|x-3|]dx$ is

(A) 1 (B) 2 (C) 4 (D) 8

40. Let $f: R\to R, g: R\to R$ be continuous functions. Then the value of integral

$$\int_{\ln\lambda}^{\ln 1/\lambda}\frac{f\left(\frac{x^2}{4}\right)[f(x)-f(-x)]}{g\left(\frac{x^2}{4}\right)[g(x)+g(-x)]}dx \text{ is}$$

(A) depend on λ (B) a non-zero constant

(C) zero (D) can't be determined

41. $\int_{-1/2}^{1/2}\sqrt{\left\{\left(\frac{x+1}{x-1}\right)^2+\left(\frac{x-1}{x+1}\right)^2-2\right\}}dx$ is

(A) $\ln\left(\frac{256}{81}\right)$ (B) $4\ln\left(\frac{3}{4}\right)$ (C) $4\ln\left(\frac{4}{3}\right)$ (D) $-\ln\left(\frac{81}{256}\right)$

PROPERTY-05

42. $\int_{2-\log 3}^{3+\log 3}\frac{\log(4+x)}{\log(4+x)+\log(9-x)}dx$

(A) cannot be evaluated (B) is equal to $\frac{5}{2}$

(C) is equal to $1+2\log 3$ (D) is equal to $\frac{1}{2}+\log 3$

43. If [x] stands for the greatest integer function, the value of $\int_4^{10}\frac{[x^2]}{[x^2-28x+196]+[x^2]}dx$ is

(A) 0 (B) 1 (C) 3 (D) −1

44. If f(x) and g(x) are continuous functions satisfying $f(x)=f(a-x)$ and $g(x)+g(a-x)=2$, then $\int_0^a f(x)g(x)dx$ is equal to

(A) $\int_0^a g(x)dx$ (B) $\int_0^a f(x)dx$ (C) 0 (D) 1

45. If $f(a+b-x)=f(x)$, then $\int_a^b xf(x)dx$ is equal to-

(A) $\frac{a+b}{2}\int_a^b f(a+b-x)dx$ (B) $\frac{a+b}{2}\int_a^b f(b-x)dx$

(C) $\frac{a+b}{2}\int_a^b f(x)dx$ (D) $\frac{b-a}{2}\int_a^b f(x)dx$

46. If $\int_0^\pi xf(\sin x)dx = A\int_0^{\pi/2} f(\sin x)dx$, then A is -

(A) 0 (B) π (C) $\pi/4$ (D) 2π

47. If $f(x)=\frac{e^x}{1+e^x}$, $I_1=\int_{f(-a)}^{f(a)} xg\{x(1-x)\}dx$ and $I_2=\int_{f(-a)}^{f(a)} g\{x(1-x)\}dx$, then the value of $\frac{I_2}{I_1}$ is-

(A) 2 (B) -3 (C) -1 (D) 1

48. The value of $\int_{-\pi}^{\pi}\frac{\cos^2x}{1+a^x}dx$, $a>0$, is -

(A) $a\pi$ (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{a}$ (D) 2π

49. $\int_{-\pi/2}^{\pi/2}\frac{|x|dx}{8\cos^2 2x+1}$ has the value

(A) $\frac{\pi^2}{6}$ (B) $\frac{\pi^2}{12}$ (C) $\frac{\pi^2}{24}$ (D) $\frac{\pi^2}{4}$

50. $\int_0^{\pi/2}\frac{dx}{1+\tan^3x}$ is equal to

(A) 0 (B) $\pi/2$ (C) $\pi/3$ (D) $\pi/4$

51. $\int_{-1}^{1}\frac{x^4}{1+e^{x^7}}dx$ is

(A) $\frac{1}{2}$ (B) 0 (C) $\frac{1}{5}$ (D) $\frac{1}{7}$

PROPERTY-06

52. $\int_{-1}^{1}\frac{\sin x+x^2}{3-|x|}dx$

(A) 0 (B) $2\int_0^1\frac{\sin x}{3-|x|}dx$ (C) $2\int_0^1\frac{x^2}{3-|x|}dx$ (D) $2\int_0^1\frac{\sin x+x^2}{3-|x|}dx$

53. $\int_{-\pi/4}^{\pi/4}\frac{e^x\sec^2x}{e^{2x}-1}dx=$

(A) 0 (B) $\frac{\pi}{2}$ (C) $2e^{\pi/4}$ (D) $\frac{\pi}{4}$

54. $\int_{-\pi}^{\pi}\frac{2x(1+\sin x)}{1+\cos^2x}=$

(A) π^2 (B) $\pi^2/4$ (C) $\pi/8$ (D) $\pi^2/8$

55. The value of integral $\int_0^\pi xf(\sin x)dx$ is

(A) $\frac{\pi}{2}\int_0^\pi f(\sin x)dx$ (B) $\pi\int_0^{\pi/2} f(\sin x)dx$

(C) 0 (D) None of these

PROPERTY-07

56. If $I = \int_0^{2\pi} \sin^2 x dx$, then

(A) $I = 2\int_0^{\pi} \sin^2 x dx$ (B) $I = 4\int_0^{\pi/2} \sin^2 x dx$

(C) $I = \int_0^{2\pi} \cos^2 x dx$ (D) $I = 8\int_0^{\pi/4} \sin^2 x dx$

57. If $f(x) = 2^{\{x\}}$, where $\{x\}$ denotes the fractioal aprt of x. Then which of the following is true ?

(A) f is periodic (B) $\int_0^1 2^{\{x\}} dx = \frac{1}{\ln 2}$

(C) $\int_0^1 2^{\{x\}} dx = \log_2 e$ (D) $\int_0^{100} 2^{\{x\}} dx = 100\log_2 e$

58. The expression $\frac{\int_0^n [x]dx}{\int_0^n \{x\}dx}$ is equal to (where $[*]$ and $\{*\}$ denotes greatest integer function and fractional part function and $n \in N$)

(A) $\frac{1}{n-1}$ (B) $\frac{1}{n}$ (C) n (D) $n-1$

PROPERTY-08

59. If $f(x) = \int_0^x (\cos^4 t + \sin^4 t)dt$, $f(x+\pi)$ will be equal to

(A) $f(x) + f(\pi)$ (B) $f(x) + 2(\pi)$ (C) $f(x) + f\left(\frac{\pi}{2}\right)$ (D) $f(x) + 2f\left(\frac{\pi}{2}\right)$

60. If $f(x) = \int_0^x (2\cos^2 3t + 3\sin^2 3t)dt$, $f(x+\pi)$ is equal to

(A) $f(x) + f(\pi)$ (B) $f(x) + 2f\left(\frac{\pi}{2}\right)$ (C) $f(x) + 4f\left(\frac{\pi}{4}\right)$ (D) $f(x) + f\left(\frac{\pi}{4}\right)$

NEWTON'S LEBNITZ

61. Let $f: R \to R$ be a differentiable function having $f(2) = 6$, $f'(2) = \left(\frac{1}{48}\right)$. Then $\lim_{x\to 2} \int_6^{f(x)} \frac{4t^3}{x-2} dt$ equals

(A) 18 (B) 12 (C) 36 (D) 24

62. The value of $\lim_{x\to 0} \frac{\int_0^{x^2} \sec^2 t dt}{x\sin x}$ is

(A) 3 (B) 2 (C) 1 (D) -1

63. $\lim_{x\to 0} \frac{\int_0^{x^2} \cos t^2 dt}{x\sin x}$ is equal to

(A) -1 (B) 1 (C) 2 (D) -2

64. If $\int_a^y \cos t^2 dt = \int_a^{x^2} \frac{\sin t}{t} dt$, then the value of $\frac{dy}{dx}$ is

(A) $\frac{2\sin^2 x}{x\cos^2 y}$ (B) $\frac{2\sin x^2}{x\cos y^2}$ (C) $\frac{2\sin x^2}{x\left(1-2\sin\frac{y^2}{2}\right)}$ (D) $\frac{\sin x^2}{\cos y^2}$

65. Let $f(x) = \int_0^x (t^2 - t + 1)dt \forall x \in (3,4)$, then the difference between the greatest and the least values of the function is

(A) $\frac{49}{6}$ (B) $\frac{59}{6}$ (C) $\frac{69}{8}$ (D) $\frac{59}{3}$

66. If $\int_{\sin x}^{1} t^2(f(t))dt = (1 - \sin x)$, then $f\left(\frac{1}{\sqrt{3}}\right)$ is

(A) $1/3$ (B) $1/\sqrt{3}$ (C) 3 (D) $\sqrt{3}$

67. The value of function

$f(x) = 1 + x + \int_1^x (\ell n^2 t + 2\ell n t)dt$ where $f'(x)$ vanishes is

(A) e^{-1} (B) 0 (C) $2e^{-1}$ (D) $1 + 2e^{-1}$

68. If $f(x) = e^{g(x)}$ and $g(x) = \int_2^x \frac{tdt}{1+t^4}$ then $f'(2)$ has the value equal to

(A) $2/17$ (B) 0 (C) 1 (D) Cannot be determined

69.

(a) If $\int_0^{t^2} xf(x)dx = \frac{2}{5}t^5, t > 0$, then $f\left(\frac{4}{25}\right) =$

(A) $2/5$ (B) $5/2$ (C) $-2/5$ (D) 1

(b) If $y(x) = \int_{\pi^2/16}^{x^2} \frac{\cos x \cdot \cos\sqrt{\theta}}{1+\sin^2\sqrt{\theta}} d\theta$ then find $\frac{dy}{dx}$ at $x = \pi$

(A) π (B) 2π (C) 3π (D) $\pi/2$

ESTIMATION

70. The smallest interval $[a, b]$ such that $\int_0^1 \frac{dx}{\sqrt{(1+x^4)}} \in [a, b]$ is given by -

(A) $[1/\sqrt{2}, 1]$ (B) $[0,1]$ (C) $[1/2,1]$ (D) $[3/4,1]$

(R/N) FORM

71. $\lim_{n\to\infty} \sum_{r=1}^{n} \left(\frac{r^3}{r^4+n^4}\right)$ equals

(A) $\log 2$ (B) $\frac{1}{2}\log 2$ (C) $\frac{1}{3}\log 2$ (D) $\frac{1}{4}\log 2$

72. $\lim_{n\to\infty} \sum_{r=2n+1}^{3n} \frac{n}{r^2-n^2}$ is equal to

(A) $\log\sqrt{\frac{2}{3}}$ (B) $\log\sqrt{\frac{3}{2}}$ (C) $\log\frac{2}{3}$ (D) $\log\frac{3}{2}$

73. The value of $\lim_{n\to\infty} \left[\left(1 + \frac{1}{n^2}\right)\left(1 + \frac{2^2}{n^2}\right) \cdots .. \left(1 + \frac{n^2}{n^2}\right)\right]^{\frac{1}{n}}$ i

(A) $\frac{e^{\frac{\pi}{2}}}{2e^2}$ (B) $2e^2 e^{\frac{\pi}{2}}$ (C) $\frac{2}{e^2} e^{\frac{\pi}{2}}$ (D) $\frac{2\pi}{e^{\frac{\pi}{2}}}$

74. $\lim_{n\to\infty} \frac{\pi}{n}\left[\sin\frac{\pi}{n} + \sin\frac{2\pi}{n} + \cdots \ldots + \sin\frac{(n-1)\pi}{n}\right]$ equals

(A) 0 (B) π (C) 2 (D) 1

75. $\lim_{n\to\infty}\left[\frac{1}{n^2}\sec^2\frac{1}{n^2}+\frac{2}{n^2}\sec^2\frac{4}{n^2}+\cdots..+\frac{1}{n}\sec^2 1\right]$ equals

(A) $\frac{1}{2}\sec 1$ (B) $\frac{1}{2}\operatorname{cosec} 1$ (C) $\tan 1$ (D) $\frac{1}{2}\tan 1$

76. $\lim_{n\to\infty}\left(\sin\frac{\pi}{2n}\cdot\sin\frac{2\pi}{2n}\cdot\sin\frac{3\pi}{2n}\ldots\ldots\cdot\sin\frac{(n-1)\pi}{2n}\right)^{1/n}$ isequal to

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$ (D) 1

77. $\lim_{n\to\infty}\sum_{r=1}^{n}\frac{\sqrt{n}}{\sqrt{r}(3\sqrt{r}+4\sqrt{n})^2}=$

(A) $\frac{1}{7}$ (B) $\frac{1}{10}$ (C) $\frac{1}{14}$ (D) $\frac{2}{7}$

78. $\operatorname{Lim}_{n\to\infty}\frac{1^P+2^P+3^P+\cdots\ldots+n^P}{n^{P+1}}$ equals-

(A) 1 (B) $\frac{1}{P+1}$ (C) $\frac{1}{P+2}$ (D) P^2

79. $\lim_{n\to\infty}\frac{1+2^4+3^4+\cdots.+n^4}{n^5}+$

$\lim_{n\to\infty}\frac{1+2^3+3^3+\cdots..+n^3}{n^5}$ is equal to-

(A) 1/5 (B) 1/30 (C) zero (D) ¼

80. $\lim_{n\to\infty}\sum_{r=1}^{n}\frac{1}{n}e^{\frac{r}{n}}$ is-

(A) e (B) $e-1$ (C) $1-e$ (D) $e+1$

81. If f(x) is integrable over [1,2], then $\int_1^2 f(x)dx$ is equal to

(A) $\lim_{n\to\infty}\frac{1}{n}\sum_{r=1}^{n}f\left(\frac{r}{n}\right)$ (B) $\lim_{n\to\infty}\frac{1}{n}\sum_{r=n+1}^{2n}f\left(\frac{r}{n}\right)$

(C) $\lim_{n\to\infty}\frac{1}{n}\sum_{r=1}^{n}f\left(\frac{r+n}{n}\right)$ (D) $\lim_{n\to\infty}\frac{1}{n}\sum_{r=1}^{2n}f\left(\frac{r}{n}\right)$

82. Given that $\lim_{n\to\infty}\sum_{r=1}^{n}\frac{\log(n^2+r^2)-2\log n}{n}=\log 2+\frac{\pi}{2}-2$, then

$\lim_{n\to\infty}\frac{1}{n^{2m}}[(n^2+1^2)^m(n^2+2^2)^m\ldots(2n^2)^m]^{1/n}$ is equal to

(A) $2^m e^{m(\pi/2-2)}$ (B) $2^m e^{m(2-\pi/2)}$ (C) $e^{m(\pi/2-2)}$ (D) $e^{2m(\pi/2-2)}$

DETERMINATION OF FUNCTION

83. If $\int_0^{x^2}f(t)dt=x\cos\pi x$, then the value of f(4) is

(A) 1 (B) 1/4 (C) -1 (D) $-1/4$

MIXED PROBLEMS

84. If $\frac{C_0}{1}+\frac{C_1}{2}+\frac{C_2}{3}=0$, where C_0, C_1, C_2 are all real, the equation $C_2x^2+C_1x+C_0=0$ has

(A) atleast one root in (0,1) (B) one root in (1,2)& other in (3,4)

(C) one root in $(-1,1)$& the other in $(-5,-2)$ (D) both roots are imaginary

85. Let $I_1 = \int_1^2 \frac{dx}{\sqrt{1+x^2}}$ and $I_2 = \int_1^2 \frac{dx}{x}$

(A) $I_1 > I_2$ (B) $I_2 > I_1$ (C) $1_1 = I_2$ (D) $I_1 > 2I_2$

86. If $l_n = \int_0^{\pi/4} \tan^n x dx$, then $\frac{1}{I_2+I_4}, \frac{1}{I_3+I_5}, \frac{1}{I_4+I_6}$ is

(A) A.P. (B) G.P (C) H.P. (D) does not form a progression

87. If $I_1 = \int_0^1 2^{x^2} dx, I_2 = \int_0^1 2^{x^3} dx, I_3 = \int_1^2 2^{x^2} dx$ and $I_4 = \int_1^2 2^{x^3} dx$ then -

(A) $I_2 > I_1$ (B) $I_1 > I_2$ (C) $I_3 = I_4$ (D) $I_3 > I_4$

88. If $u_n = \int_0^{\pi/2} x^n \sin x dx, n \in N$ then the value of $u_{10} + 90u_8$ is

(A) $9\left(\frac{\pi}{2}\right)^8$ (B) $\left(\frac{\pi}{2}\right)^9$ (C) $10\left(\frac{\pi}{2}\right)^9$ (D) $9\left(\frac{\pi}{2}\right)^9$

89. A function f(x) which satisfies, $f'(\sin^2 x) = \cos^2 x$ for all real x&$f(1) = 1$ is

(A) $f(x) = x - \frac{x^3}{3} + \frac{1}{3}$ (B) $f(x) = x^2 - \frac{x}{2} + \frac{1}{2}$

(C) a polynomial of degree two (D) $f(0) = 1/2$

90. If $1_n = \int_0^1 \frac{dx}{(1+x^2)^n}$; $n \in N$, then which of the following statements hold good?

(A) $2n1_{n+1} = 2^{-n} + (2n-1)1_n$ (B) $l_2 = \frac{\pi}{8} + \frac{1}{4}$

(C) $1_2 = \frac{\pi}{8} - \frac{1}{4}$ (D) $l_3 = \frac{\pi}{16} - \frac{5}{48}$

91. If $k \in N$ and $I_k = \int_{-2k\pi}^{2k\pi} |\sin x|[\sin x]dx$, (where [.] denotes the greatest integer function) then $\sum_{k=1}^{100} I_k$ equals to

(A) -10100 (B) -40400 (C) 20200 (D) none of these

92. The value of $\int_{-6}^{6} \max(|2-|x||, 4-|x|, 3)dx$ is

(A) 40 (B) 50 (C) 60 (D) 30

ANSWER KEY

1.	(A)	**2.**	(D)	**3.**	(A)	**4.**	(B)	**5.**	(D)	**6.**	(C)	**7.**	(D)
8.	(B)	**9.**	(D)	**10.**	(B)	**11.**	(A)	**12.**	(A)	**13.**	(C)	**14.**	(AC)
15.	(ABCD)			**16.**	(D)	**17.**	(C)	**18.**	(D)	**19.**	(B)	**20.**	(C)
21.	(C)	**22.**	(D)	**23.**	(A)	**24.**	(A)	**25.**	(C)	**26.**	(A)	**27.**	(B)
28.	(A)	**29.**	(B)	**30.**	(D)	**31.**	(C)	**32.**	(C)	**3.**	(C)	**34.**	(C)
35.	(B)	**36.**	(D)	**37.**	3.5	**38.**	(B)	**39.**	(B)	**40.**	(C)	**41.**	(ABCD)
42.	(D)	**43.**	(C)	**44.**	(B)	**45.**	(AC)	**46.**	(B)	**47.**	(A)	**48.**	(B)
49.	(B)	**50.**	(D)	**51.**	(C)	**52.**	(C)	**53.**	(A)	**54.**	(A)	**55.**	(AB)
56.	(ABC)	**57.**	(ABCD)			**58.**	(D)	**59.**	(AD)	**60.**	(AB)	**61.**	(A)
62.	(C)	**63.**	(B)	**64.**	(B)	**65.**	(B)	**66.**	(C)	**67.**	(D)	**68.**	(A)
69.	**(a)**(A),**(b)**(B)			**70.**	(A)	**71.**	(D)	**72.**	(B)	**73.**	(C)	**74.**	(C)
75.	(D)	**76.**	(A)	**77.**	(C)	**78.**	(B)	**79.**	(A)	**80.**	(B)	**81.**	(BC)
82.	(A)	**83.**	(B)	**84.**	(A)	**85.**	(B)	**86.**	(A)	**87.**	(B)	**88.**	(C)
89.	(CD)	**90.**	(AB)	**91.**	(D)	**92.**	(A)						