Date Planned : __ / __ / __	Daily Tutorial Sheet - 7	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	JEE Advanced (Archive)	Exact Duration :________

61. Determine a positive integer $n \le 5$, such that $\int_0^1 e^x (x-1)^n \, dx = 16 - 6e$ **(1992)**

62. If 'f' is a continuous function with $\int_0^x f(t)\, dt \to \infty$ as $|x| \to \infty$, then show that every line $y = mx$ intersects the curve $y^2 + \int_0^x f(t) dt = 2$ **(1991)**

63. Investigate for maxima and minima the function, $f(x) = \int_1^x [2(t-1)(t-2)^3 + 3(t-1)^2(t-2)^2]\, dt$ **(1988)**

***64.** For $a \in R$ the set of all real numbers), $a \ne -1$, $\lim_{n\to\infty} \frac{(1^a + 2^a + \ldots + n^a)}{(n+1)^{a-1}[(na+1)+(na+2)+\ldots+(na+n)]} = \frac{1}{60}$. Then, a is equal to: **(2010)**

(A) 5 **(B)** 7 **(C)** $\frac{-15}{2}$ **(D)** $-\frac{17}{2}$

***65.** Let $S_n = \sum_{k=0}^{n} \frac{n}{n^2 + kn + k^2}$ and $T_n = \sum_{k=0}^{n-1} \frac{n}{n^2 + kn + k^2}$, In $n = 1, 2, 3, \ldots$, then: **(2008)**

(A) $S_n < \frac{\pi}{3\sqrt{3}}$ **(B)** $S_n > \frac{\pi}{3\sqrt{3}}$ **(C)** $T_n < \frac{\pi}{3\sqrt{3}}$ **(D)** $T_n > \frac{\pi}{3\sqrt{3}}$

66. Show that, $\lim_{n\to\infty}\left(\frac{1}{n+1} + \frac{1}{n+2} + \ldots + \frac{1}{6n}\right) = \log 6$. **(1981)**

67. The common tangents to the circle $x^2 + y^2 = 2$ and the parabola $y^2 = 8x$ touch the circle at the points P,Q and the parabola at the points R, S. Then, the area (in square units) of the quadrilateral PQRS is: **(2014)**

(A) 3 **(B)** 6 **(C)** 9 **(D)** 15

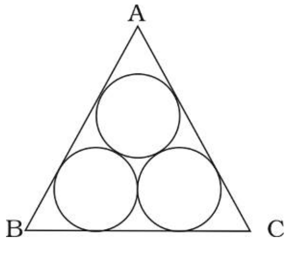
68. The area of the equilateral triangle, in which three coins of radius 1 cm are placed, as shown in the figure, is: **(2005)**

(A) $\left(6 + 4\sqrt{3}\right)$ square units

(B) $\left(4\sqrt{3} - 6\right)$ square units

(C) $\left(7 + 4\sqrt{3}\right)$ square units

(D) $4\sqrt{3}$ square cm



69. The area of the triangle formed by the positive X-axis and the normal and the tangent to the circle $x^2 + y^2 = 4$ at $\left(1, \sqrt{3}\right)$ is: **(1989)**

70. The area enclosed within the curve $|x| + |y| = 1$ is: **(1981)**