www.theOPGupta.com

Solutions Of JEE Main (2016) Code F

MATHEMATICS

Prepared By : O. P. GUPTA
Mob. +919650350480
Email : theopgupta@gmail.com

PART B – MATHEMATICS

31. Two sides of a rhombus are along the lines, $x - y + 1 = 0$ and $7x - y - 5 = 0$. If its diagonals intersect at $(-1, -2)$, then which one of the following is a vertex of this rhombus?

(1) $(-3, -8)$
(2) $\left(\frac{1}{3}, -\frac{8}{3}\right)$
(3) $\left(-\frac{10}{3}, -\frac{7}{3}\right)$
(4) $(-3, -9)$

32. If the 2^{nd}, 5^{th} and 9^{th} terms of a non–constant A.P. are in G.P., then the common ratio of this G.P. is:

(1) $\frac{4}{3}$
(2) 1
(3) $\frac{7}{4}$
(4) $\frac{8}{5}$

33. Let P be the point on the parabola, $y^2 = 8x$ which is at a minimum distance from the centre C of the circle, $x^2 + (y + 6)^2 = 1$. Then the equation of the circle, passing through C and having its centre at P is:

(1) $x^2 + y^2 - x + 4y - 12 = 0$
(2) $x^2 + y^2 - \frac{x}{4} + 2y - 24 = 0$
(3) $x^2 + y^2 - 4x + 9y + 18 = 0$
(4) $x^2 + y^2 - 4x + 8y + 12 = 0$

34. The system of linear equations

$x + \lambda y - z = 0$
$\lambda x - y - z = 0$
$x + y - \lambda z = 0$

has a non–trivial solution for :

(1) exactly one value of λ.
(2) exactly two values of λ.
(3) exactly three values of λ.
(4) infinitely many values of λ.

35. If $f(x) + 2f\left(\frac{1}{x}\right) = 3x,\ x \neq 0$, and $S = \{x \in R : f(x) = f(-x)\}$; then S:

(1) contains exactly one element.
(2) contains exactly two elements.
(3) contains more than two elements.
(4) is an empty set.

36. Let $p = \lim_{x \to 0+} \left(1 + \tan^2 \sqrt{x}\right)^{\frac{1}{2x}}$ then log p is equal to:

(1) 1
(2) $\frac{1}{2}$
(3) $\frac{1}{4}$
(4) 2.

37. A value of θ for which $\frac{2 + 3i\sin\theta}{1 - 2i\sin\theta}$ is purely imaginary, is:

(1) $\frac{\pi}{6}$
(2) $\sin^{-1}\left(\frac{\sqrt{3}}{4}\right)$
(3) $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$
(4) $\frac{\pi}{3}$

38. The eccentricity of the hyperbola whose length of the latus rectum is equal to 8 and the length of its conjugate axis is equal half of the distance between its foci, is:

(1) $\frac{4}{\sqrt{3}}$ (2) $\frac{2}{\sqrt{3}}$

(3) $\sqrt{3}$ (4) $\frac{4}{3}$

39. If the standard deviation of the numbers 2, 3, a and 11 is 3.5, then which of the following is true?

(1) $3a^2 - 32a + 84 = 0$ (2) $3a^2 - 34a + 91 = 0$

(3) $3a^2 - 23a + 44 = 0$ (4) $3a^2 - 26a + 55 = 0$

40. The integral $\int \frac{2x^{12} + 5x^9}{(x^5 + x^3 + 1)^3} dx$ is equal to:

(1) $\frac{x^{10}}{2(x^5 + x^3 + 1)^2} + C$ (2) $\frac{x^5}{2(x^5 + x^3 + 1)^2} + C$

(3) $\frac{-x^{10}}{2(x^5 + x^3 + 1)^2} + C$ (4) $\frac{-x^5}{(x^5 + x^3 + 1)^2} + C$

where C is an arbitrary constant.

41. If the line, $\frac{x-3}{2} = \frac{y+2}{-1} = \frac{z+4}{3}$ lies in the plane, $lx + my - z = 9$, then $l^2 + m^2$ is equal to:

(1) 18 (2) 5

(3) 2 (4) 26

42. If $0 \le x < 2\pi$, then the number of real values of x, which satisfy the equation $\cos x + \cos 2x + \cos 3x + \cos 4x = 0$ is:

(1) 5 (2) 7

(3) 9 (4) 3

43. The area (in sq. units) of the region $\{(x, y) : y^2 \ge 2x \text{ and } x^2 + y^2 \le 4x, x \ge 0, y \ge 0\}$ is:

(1) $\pi - \frac{8}{3}$ (2) $\pi - \frac{4\sqrt{2}}{3}$

(3) $\frac{\pi}{2} - \frac{2\sqrt{2}}{3}$ (4) $\pi - \frac{4}{3}$

44. Let $\vec{a}, \vec{b}$ and $\vec{c}$ be three unit vectors such that $\vec{a} \times (\vec{b} \times \vec{c}) = \frac{\sqrt{3}}{2}(\vec{b} + \vec{c})$. If $\vec{b}$ is not parallel to $\vec{c}$, then the angle between $\vec{a}$ and $\vec{b}$ is:

(1) $\frac{\pi}{2}$ (2) $\frac{2\pi}{3}$

(3) $\frac{5\pi}{6}$ (4) $\frac{3\pi}{4}$

45. A wire of length 2 units is cut into two parts which are bent respectively to form a square of side = x units and a circle of radius = r units. If the sum of the areas of the square and the circle so formed is minimum, then:

(1) $(4 - \pi)x = \pi r$ (2) $x = 2r$

(3) $2x = r$ (4) $2x = (\pi + 4)r$

46. The distance of the point (1, –5, 9) from the plane $x - y + z = 5$ measured along the line $x = y = z$ is:

(1) $10\sqrt{3}$ (2) $\frac{10}{\sqrt{3}}$

(3) $\frac{20}{3}$ (4) $3\sqrt{10}$

47. If a curve $y = f(x)$ passes through the point (1, –1) and satisfies the differential equation, $y(1 + xy)\,dx = x\,dy$, then $f\left(-\frac{1}{2}\right)$ is equal to:

(1) $-\frac{4}{5}$ (2) $\frac{2}{5}$

(3) $\frac{4}{5}$ (4) $-\frac{2}{5}$

48. If the number of terms in the expansion of $\left(1-\frac{2}{x}+\frac{4}{x^2}\right)^n$, $x \neq 0$, is 28, then the sum of the coefficients of all the terms in this expansion, is:

(1) 2187 (2) 243

(3) 729 (4) 64

49. Consider

$f(x) = \tan^{-1}\left(\sqrt{\frac{1+\sin x}{1-\sin x}}\right), x \in \left(0, \frac{\pi}{2}\right)$. A normal to $y = f(x)$ at $x = \frac{\pi}{6}$ also passes through the point:

(1) $\left(0, \frac{2\pi}{3}\right)$ (2) $\left(\frac{\pi}{6}, 0\right)$

(3) $\left(\frac{\pi}{4}, 0\right)$ (4) (0, 0)

50. For $x \in \mathbf{R}$, $f(x) = |\log 2 - \sin x|$ and $g(x) = f(f(x))$, then:

(1) $g'(0) = \cos(\log 2)$

(2) $g'(0) = -\cos(\log 2)$

(3) g is differentiable at x = 0 and $g'(0) = -\sin(\log 2)$

(4) g is not differentiable at x = 0

51. Let two fair six–faced dice A and B be thrown simultaneously. If E_1 is the event that die A shows up four, E_2 is the event that die B shows up two and E_3 is the event that the sum of numbers on both dice is odd, then which of the following statements is **NOT true**?

(1) E_2 and E_3 are independent. (2) E_1 and E_3 are independent.

(3) E_1, E_2 and E_3 are independent. (4) E_1 and E_2 are independent.

52. If $A=\begin{bmatrix}5a & -b\\ 3 & 2\end{bmatrix}$ and A adj A = A A^T, then 5a + b is equal to:

(1) 5 (2) 4
(3) 13 (4) – 1

53. The Boolean Expression $(p\wedge{\sim}q)\vee q\vee({\sim}p\wedge q)$ is equivalent to:

(1) $p\wedge q$ (2) $p\vee q$
(3) $p\vee{\sim}q$ (4) ${\sim}p\wedge q$

54. The sum of all real values of x satisfying the equation

$(x^2-5x+5)^{x^2+4x-60}=1$ is

(1) – 4 (2) 6
(3) 5 (4) 3

55. The centres of those circles which touch the circle, $x^2+y^2-8x-8y-4=0$, externally and also touch the x–axis, lie on:

(1) an ellipse which is not a circle. (2) a hyperbola.
(3) a parabola. (4) a circle.

56. If all the words (with or without meaning) having five letters, formed using the letters of the word SMALL and arranged as in a dictionary; then the position of the word SMALL is:

(1) 59^{th} (2) 52^{nd}
(3) 58^{th} (4) 46^{th}

57. $\lim\limits_{n\to\infty}\left(\dfrac{(n+1)(n+2)\ldots 3n}{n^{2n}}\right)^{1/n}$ is equal to:

(1) $\dfrac{27}{e^2}$ (2) $\dfrac{9}{e^2}$
(3) 3 log3 – 2 (4) $\dfrac{18}{e^4}$

58. If the sum of the first ten terms of the series $\left(1\frac{3}{5}\right)^2+\left(2\frac{2}{5}\right)^2+\left(3\frac{1}{5}\right)^2+4^2+\left(4\frac{4}{5}\right)^2+\ldots$, is $\frac{16}{5}m$, then m is equal to:

(1) 101 (2) 100
(3) 99 (4) 102

59. If one of the diameters of the circle, given by the equation, $x^2+y^2-4x+6y-12=0$, is a chord of a circle S, whose centre is at (–3, 2), then the radius of S is:

(1) $5\sqrt{3}$ (2) 5
(3) 10 (4) $5\sqrt{2}$

60. A man is walking towards a vertical pillar in a straight path, at a uniform speed. At a certain point A on the path, he observes that the angle of elevation of the top of the pillar is 30º. After walking for 10 minutes from A in the same direction, at a point B, he observes that the angle of elevation of the top of the pillar is 60º. Then the time taken (in minutes) by him, from B to reach the pillar, is:

(1) 10 (2) 20
(3) 5 (4) 6

Solutions

31. Remaining two sides of rhombus are x – y – 3 = 0 and 7x – y + 15 = 0.

So on solving, we get vertices as $\left(\frac{1}{3}, -\frac{8}{3}\right)$, (1, 2), $\left(-\frac{7}{3}, -\frac{4}{3}\right)$ and $(-3, -6)$.

32. Let the G.P. be a, ar, ar^2 and terms of A.P. are A + d, A +4d, A + 8d

then $\frac{ar^2 - ar}{ar - a} = \frac{(A + 8d) - (A + 4d)}{(A + 4d) - (A + d)} = \frac{4}{3}$

$\Rightarrow r = \frac{4}{3}$.

Alternate Solution:

Let AP is a, a + d, a + 2d .....

2nd, 5th and 9th terms a + d, a + 4d, a + 8d are in GP

$\Rightarrow (a + 4d)^2 = (a + d)(a + 8d)$

$\Rightarrow d(8d - a) = 0 \Rightarrow 8d = a$ as $d \neq 0$

Hence common ratio of GP $\frac{a + 4d}{a + d} = \frac{8d + 4d}{8d + d} = \frac{12d}{9d} = \frac{4}{3}$.

33. Equation of normal at P is

$$y = -tx + 4t + 2t^3$$

It passes through C(0, –6)

$\therefore \quad -6 = 4t + 2t^3$

$\Rightarrow \quad t^3 + 2t + 3 = 0$

$\Rightarrow \quad t = -1$

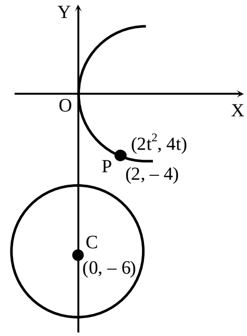
Hence P is (2, – 4)

$$r = \sqrt{4+4} = 2\sqrt{2}$$

Equation of required circle

$$(x-2)^2 + (y+4)^2 = 8$$

$\Rightarrow \quad x^2 + y^2 - 4x + 8y + 12 = 0$



34. For non-trivial solution

$$\begin{vmatrix} 1 & \lambda & -1 \\ \lambda & -1 & -1 \\ 1 & 1 & -\lambda \end{vmatrix} = 0$$

$1(\lambda + 1) - \lambda(-\lambda^2 + 1) - 1(\lambda + 1) = 0$

$\lambda + 1 + \lambda^3 - \lambda - \lambda - 1 = 0$

$\lambda(\lambda^2 - 1) = 0 \Rightarrow \lambda = 0, \lambda = \pm 1.$

35. $f(x) + 2f\left(\frac{1}{x}\right) = 3x$

replace x by $\frac{1}{x}$

$f\left(\frac{1}{x}\right) + 2f(x) = \frac{3}{x}$

$\Rightarrow f(x) = \frac{2}{x} - x$ as $f(x) = f(-x) \Rightarrow x = \pm\sqrt{2}$

36. $p = \lim_{x\to 0^+} \left(1 + \tan^2\sqrt{x}\right)^{\frac{1}{2x}}$

$= e^{\lim_{x\to 0^+} \frac{\tan^2\sqrt{x}}{2x}}$

$= e^{\lim_{x\to 0^+} \frac{1}{2}\left(\frac{\tan\sqrt{x}}{\sqrt{x}}\right)^2}$

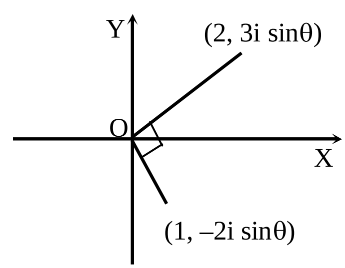
$p = e^{\frac{1}{2}}$

37. $\frac{2+3i\sin\theta}{1-2i\sin\theta}$ is purely imaginary $\in$ $\text{Arg}\left(\frac{2+3i\sin\theta}{1-2i\sin\theta}\right) = \frac{\pi}{2}, -\frac{\pi}{2}$

$\Rightarrow$ product of slopes taken as in xy plane is – 1

$\Rightarrow \frac{3\sin\theta}{2} \cdot \frac{-2\sin\theta}{1} = -1$

$\Rightarrow \sin^2\theta = \frac{1}{3}, \theta = \sin^{-1}\left(\frac{1}{\sqrt{3}}\right).$



Alternate Solution:

$\frac{2+3i\sin\theta}{1-2i\sin\theta} = \frac{2-6\sin^2\theta+7i\sin\theta}{1+4\sin^2\theta}$ is purely imaginary

$$\Rightarrow \frac{2-6\sin^2\theta}{1+4\sin^2\theta}=0 \Rightarrow 6\sin^2\theta = 2.$$

38. Given, $\frac{2b^2}{a}=8$ and $2b=\frac{1}{2}(2ae)$

$2b = ae$

$4b^2 = a^2 \cdot e^2$

$3e^2 = 4 \Rightarrow e = \frac{2}{\sqrt{3}}$

39. $\bar{x}=\frac{2+3+a+11}{4}=\frac{a}{4}+4$

$$\sigma=\sqrt{\sum\frac{x_i^2}{n}-(\bar{x})^2}$$

$$3.5=\sqrt{\frac{4+9+a^2+121}{4}-\left(\frac{a}{4}+4\right)^2}$$

$$\Rightarrow \frac{49}{4}=\frac{4\left(134+a^2\right)-\left(a^2+256+32a\right)}{16}$$

$\Rightarrow 3a^2 - 32a + 84 = 0$

40. $I=\int\frac{\left(\frac{2}{x^3}+\frac{5}{x^6}\right)}{\left(1+\frac{1}{x^2}+\frac{1}{x^5}\right)^3}dx$, let $1+\frac{1}{x^2}+\frac{1}{x^5}=t$

Hence $I=\frac{x^{10}}{2\left(x^5+x^3+1\right)^2}+c$.

41. As line $\frac{x-3}{2}=\frac{y+2}{-1}=\frac{z+4}{3}$ lies in plane $\ell x+my-z=9$

So $2\ell-m-3=0$ (as line is perpendicular to normal of the plane) ..... (1)

Also point (3, –2, –4) lies in plane

So $3\ell-2m-5=0$ ..... (2)

From equation (1) and (2), we get $\ell=1$, $m=-1$

So $\ell^2+m^2=2$

42. $$2\cos\frac{5x}{2}\cdot\cos\frac{3x}{2}+2\cos\frac{5x}{2}\cdot\cos\frac{x}{2}=0$$

$$\Rightarrow \cos\frac{5x}{2}\cdot\left(2\cdot\cos x\cdot\cos\frac{x}{2}\right)=0$$

$$\Rightarrow \frac{x}{2}=(2n+1)\frac{\pi}{2},\quad x=(2m+1)\frac{\pi}{2},\quad \frac{5x}{2}=(2k+1)\frac{\pi}{2}, \text{ (where n, m, k} \in Z)$$

$$\Rightarrow x=(2n+1)\pi,\quad x=(2m+1)\frac{\pi}{2},\quad x=(2k+1)\frac{\pi}{5}$$

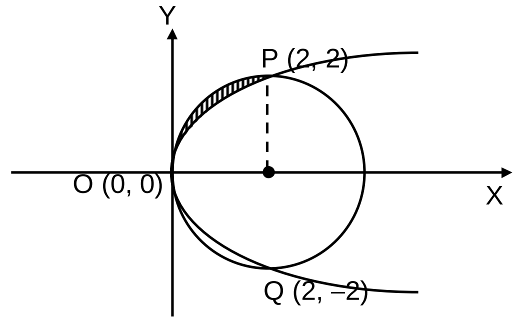
$$\Rightarrow x=\pi, \frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{5}, \frac{3\pi}{5}, \frac{7\pi}{5}, \frac{9\pi}{5}.$$

43. The point of intersection of the curve $x^2 + y^2 = 4x$ $y^2 = 2x$ are (0, 0) and (2, 2) for $x \ge 0$ and $y \ge 0$

So required area = $\frac{1}{4}\pi \times 4 - \int_0^2 \sqrt{2x}\,dx$

$= \pi - \sqrt{2}\cdot\frac{2}{3}\left[x^{3/2}\right]_0^2$

$= \pi - \frac{8}{3}$



44. $\vec{a}\times(\vec{b}\times\vec{c}) = \frac{\sqrt{3}}{2}(\vec{b}+\vec{c})$

$\Rightarrow (\vec{a}\cdot\vec{c})\vec{b} - (\vec{a}\cdot\vec{b})\vec{c} = \frac{\sqrt{3}}{2}(\vec{b}+\vec{c})$

$\Rightarrow \vec{a}\cdot\vec{c} = \frac{\sqrt{3}}{2}$ and $\vec{a}\cdot\vec{b} = -\frac{\sqrt{3}}{2}$

$\Rightarrow \cos\theta = -\frac{\sqrt{3}}{2}$ where θ is angle between $\vec{a}$ & $\vec{b}$

$\therefore\ \theta = \frac{5\pi}{6}$.

45. $f(x) = x^2 + \frac{(1-2x)^2}{\pi}$ (As $r = \frac{1-2x}{\pi}$)

$f'(x) = 2x - \frac{4(1-2x)}{\pi}$

$f''(x) = 2 + \frac{8}{\pi} > 0$

For minimum value of sum of area $f'(x) = 0$

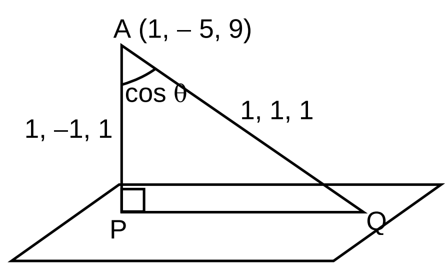
$x = \frac{2}{\pi+4} \Rightarrow r = \frac{1}{\pi+4}$

$\Rightarrow x = 2r$.

46. $\cos\theta = \frac{1-1+1}{3} = \frac{1}{3}$

$\cos\theta = \frac{AP}{AQ}$

$AQ = \frac{AP}{\cos\theta} = 10\sqrt{3}$



47. $y(1 + xy)\,dx = x\,dy$

$\frac{x\,dy - y\,dx}{y^2} = x\,dx$

$\int -d\left(\frac{x}{y}\right) = \int x\,dx$

$-\frac{x}{y}=\frac{x^2}{2}+c$ as $y(1) = -1 \Rightarrow c = \frac{1}{2}$

Hence $y = \frac{-2x}{x^2+1} \Rightarrow f\left(-\frac{1}{2}\right)=\frac{4}{5}$.

48. Total number of terms $= {}^{n+2}C_2 = 28$

$(n + 2)(n + 1) = 56$

$n = 6$

Sum of coefficients = $(1 - 2 + 4)^n$

$= 3^6 = 729$

[*Note: In the solution it is considered that different terms in the expansion having same powers are not merged, as such it should be a bonus question.]

49. $f(x) = \tan^{-1}\sqrt{\frac{1+\sin x}{1-\sin x}}$, where $x \in \left(0, \frac{\pi}{2}\right)$

$= \tan^{-1}\left(\left|\tan\left(\frac{\pi}{4}+\frac{x}{2}\right)\right|\right)$

$\Rightarrow f(x) = \frac{\pi}{4}+\frac{x}{2}$, $\quad f\left(\frac{\pi}{6}\right)=\frac{\pi}{3}$

$f'(x) = \frac{1}{2}$

Equation of normal is

$y-\frac{\pi}{3}=-2\left(x-\frac{\pi}{6}\right)$

It passes through $\left(0, \frac{2\pi}{3}\right)$.

50. At $x = 0$, f is differential and $f'(0) = -\cos 0 = -1$

$g'(0) = f'(f(0))\cdot f'(0)$

$= -\cos(\log 2) \times -1$ (at $x = 0$, $f(0) = \log 2$)

$= \cos(\log 2)$

51. $P(E_1)=\frac{1}{6},\ P(E_2)=\frac{1}{6},\ P(E_3)=\frac{1}{2}$

Also $P(E_1 \cap E_2)=\frac{1}{36},\ P(E_2 \cap E_3)=\frac{1}{12},\ P(E_1 \cap E_3)=\frac{1}{12}$

And $P(E_1 \cap E_2 \cap E_3) = 0 \neq P(E_1)\cdot P(E_2)\cdot P(E_3)$

Hence, E_1, E_2, E_3 are not independent.

52. $A \text{ adj } A = |A|\, I_n = \begin{bmatrix} 5a & -b \\ 3 & 2 \end{bmatrix}\begin{bmatrix} 5a & 3 \\ -b & 2 \end{bmatrix}$

$\Rightarrow (10a+3b)\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 25a^2+b^2 & 15a-2b \\ 15a-2b & 13 \end{bmatrix}$

$\Rightarrow 15a - 2b = 0$ and $10a + 3b = 13$

$\Rightarrow 5a + b = 5\times\frac{2}{5}+3=5$.

53. $(p \wedge \sim q) \vee q \vee (\sim p \wedge q)$

$\equiv \{(p \vee q) \wedge (\sim q \vee q)\} \vee (\sim p \wedge q)$

$\equiv \{(p \vee q) \wedge T\} \vee (\sim p \wedge q)$

$\equiv (p \vee q) \vee (\sim p \wedge q)$

$\equiv \{(p \vee q) \vee \sim p\} \wedge (p \vee q \vee q)$

$\equiv T \wedge (p \vee q)$

$\equiv p \vee q$

54. Either $x^2 - 5x + 5 = 1$ or $x^2 + 4x - 60 = 0$

$x = 1, 4$ or $x = -10, 6$

Also $x^2 - 5x + 5 = -1$ and $x^2 + 4x - 60 \in$ even number

$x = 2, 3$

For $x = 3$ $x^2 + 4x - 60$ is odd

Total solutions are $x = 1, 4, -10, 6, 2$

$\Rightarrow$ Sum = 3

55. Let (h, k) be the centre of the circle which touch x–axis and $x^2 + y^2 - 8x - 8y - 4 = 0$ externally.

$\Rightarrow$ Radius of that circle is $|k|$

$\Rightarrow$ $(h-4)^2 + (k-4)^2 = (|k| + 6)^2$

$\Rightarrow$ $x^2 - 8x - 20y - 4 = 0$ if $y \ge 0$

and $x^2 - 8x + 4y - 4 = 0$ if $y < 0$

$\Rightarrow$ The curve is parabola.

56. Words starting with A, L, M = $\frac{4!}{2!} + 4! + \frac{4!}{2!} = 48$

Words starting with SA, SL = $\frac{3!}{2!} + 3! = 9$

$\Rightarrow$ Rank of the word SMALL = 58.

57. $\ln y = \lim_{n\to\infty} \frac{1}{n} \cdot \log\left(1+\frac{1}{n}\right)\left(1+\frac{2}{n}\right)\ldots\left(1+\frac{2n}{n}\right)$

$= \frac{1}{n} \cdot \sum_{r=1}^{2n} \ln\left(1+\frac{r}{n}\right)$

$\ln y = \int_0^2 \ln(1+x)\,dx$, let $t = 1 + x$

$= \int_1^3 \ln t\,dt$

$= \ln \frac{27}{e^2}$

58. Let $S = \left(\frac{8}{5}\right)^2 + \left(\frac{12}{5}\right)^2 + \left(\frac{16}{5}\right)^2 + \left(\frac{20}{5}\right)^2 + \ldots\ldots + \left(\frac{44}{5}\right)^2$

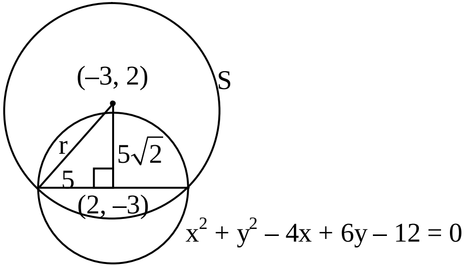
$\Rightarrow S = \frac{16}{25}\left[2^2 + 3^2 + 4^2 + 5^2 \ldots\ldots + 11^2\right]$

$\Rightarrow S = \frac{16}{25}\left[1^2 + 2^2 \ldots + 11^2 - 1\right] = \frac{16}{5} \times 101$

$\Rightarrow m = 101$

59. Let ‘r’ be the radius of circle S

$\Rightarrow r = 5\sqrt{3}$



60. $\tan 60^\circ = \frac{h}{x} \Rightarrow h = \sqrt{3}x$

$\tan 30^\circ = \frac{h}{x+y} \Rightarrow \sqrt{3}h = x + y$

$3x = x + y$

$\Rightarrow 2x = y$

Time taken from A to B is 10 min

So time taken from B to pillar is 5 min