TECHNO INDIA GROUP PUBLIC SCHOOLS

JEE (Main)-XI

Monthly Mock Test - 1 (August-2025)

Time Allowed: **3 hours**   Maximum Marks: **300**

General Instructions:

1. There are three subjects in the question paper consisting of Physics (Q. no. 1 to 25), Chemistry (Q, no. 26 to 50), and Mathematics (Q. no. 51 to 75).

2. Each subject is divided into two sections. Section A consists of 20 multiple-choice questions & Section B consists of 5 numerical value-type questions.

3. There will be only one correct choice in the given four choices in Section A. For each question for Section A, 4 marks will be awarded for correct choice, 1 mark will be deducted for incorrect choice questions and zero marks will be awarded for not attempted questions.

4. For Section B questions, 4 marks will be awarded for correct choice, 1 mark will be deducted for incorrect choice questions and zero marks will be awarded for not attempted questions.

5. Any textual, printed, or written material, mobile phones, calculator etc. is not allowed for the students appearing for the test.

6. All calculations/written work should be done in the rough sheet, provided with the Question Paper.

PHYSICS

SECTION A

Section A consists of 20 questions of 4 marks each.

1. In the formula $X = 5yz^2$ if $[y] = L$, $[Z] = T^{-1}$, then $[X] =$ [4]

   ① LT^{-2} ② LT^{-1} ③ LT ④ $L^{-1}T^{-2}$

2. If speed (v), acceleration (A) and force (F) are considered as fundamental unit, then $[mass] =$ [4]

   ① FA ② FA^{-1} ③ $F^{-1}A$ ④ FAV

3. F (force) $= \alpha\, e^x$ then $[x] =$ [4]

   ① M ② L ③ $M^\circ L^\circ T^\circ$ ④ T

4. The density of a material in SI units is 128 kg m^{-3}. In certain unit of mass is 50g and length is 25 cm, the numerical value of density of the material is [4]

   ① 40 ② 16 ③ 640 ④ 410

5. In the relation, $p = \dfrac{\alpha}{\beta}\, e^{\frac{-\alpha z}{k\theta}}$ [4]

   P is pressure, Z is distance, K is Boltzman constant and 'θ' is temperature. The dimensional formula of β is

   ① $[M^\circ L^2 T^\circ]$ ② $[ML^2 T]$ ③ $[ML^\circ T^{-1}]$ ④ $[M^\circ L^2 T^{-1}]$

6. The area of a square is 5.29 cm^2. The area of 7 such squares taking into account the significant figures is [4]

   ① 37.030 cm^2 ② 37.0 cm^2 ③ 37.03 cm^2 ④ 37 cm^2

7. in the density measurement of a cube, the mass and edge length are measured as (10.00 ± 0.10) kg and (0.10 ± 0.01) m respectively. The error in the measurement of density is [4]

   ① $0.01 \text{ kg}/\text{m}^3$ ② $0.10 \text{ kg}/\text{m}^3$ ③ $0.07 \text{ kg}/\text{m}^3$ ④ none of these

8. The circular scale of a screw gauge has 50 divisions and pitch of 0.5 mm. The leas count of screw gauge is [4]

   ① 0.1 mm   ② 0.01 mm   ③ 0.001 mm   ④ 1 mm

9. A vernier calipers has 1 mm marks on the main scale. It has 20 equal divisions on the vernier scale which match with 16 main scale divisions. For this vernier calipers, the least count is [4]

   ① 0.02 mm   ② 0.05 mm   ③ 0.1 mm   ④ 0.2 mm

10. The least count of main scale of a screw gauge is 1 mm. The minimum number of divisions on its circular scale required to measure $5\,\mu\text{m}$ diameter of a wire is [4]

    ① 50 ② 200 ③ 500 ④ 100

11. A particle is moving with speed $v = b\sqrt{x}$ along positive x-axis. Calculate the speed of the particle at time $t = \tau$ (assume that the particle is at origin at $t = 0$) [4]

    ① $\dfrac{b^2 \tau}{4}$ ② $\dfrac{b^2 \tau}{2}$ ③ $b^2 \tau$ ④ $\dfrac{b^2 \tau}{\sqrt{2}}$

12. A particle is moving Eastwards with a velocity of 5 m/s. In 10s, the velocity changes to 5 m/s northwards. The average acceleration in this time is [4]

① 0

② $\frac{1}{\sqrt{2}}$ m/s² towards North-East

③ $\frac{1}{\sqrt{2}}$ m/s² towards North-West

④ $\frac{1}{\sqrt{2}}$ m/s² towards North

13. A particle moves from the point $(2\hat{e} + 4\hat{j})$m with $\vec{\mu} = (5\hat{i} + 4\hat{j})$ m/s. It is acted upon by a constant force which produces a constant acceleration $(4\hat{i} + 4\hat{j})$ ms⁻². What is the distance of the particle from the origin at time 2s ? [4]

① 5m ② $20\sqrt{2}$ m ③ $10\sqrt{2}$ m ④ 15 m

14. From a tower of height H, a particle is thrown vertically upwards with a speed u. The time taken by the particle to hit the ground, is n times that taken by it to reach the highest point of its path. Then [4]

① $2gH = n^2u^2$

② $gH = (n-2)^2 u^2$

③ $2gH = nu^2 (n-2)$

④ $gH = (n+2)^2 u^2$

15. A small block slides without friction down on inclined plane starting from rest. Let S_n be the distance travelled from $t = n-1$ to $t = n$. Then $\frac{S_n}{S_{n+1}}$ is [4]

① $\frac{2n-1}{2n}$

② $\frac{2n+1}{2n-1}$

③ $\frac{2n-1}{2n+1}$

④ $\frac{2n}{2n+1}$

16. The stream of a river is flowing with a speed of 2km/h. A swimmer can swim at a speed of 4 km/h. What should be the direction of swimmer with respect to the flow of the river to cross the river straight ? [4]

① 60° ② 120° ③ 90° ④ 150°

17. P_1 be the position of a plane at t = 0 when sound waves started towards person at A and P_2 is the position of plane observed at time instant t as shown in the above. If v is the speed of sound, the speed of plane $v_p =$ [4]

① $\frac{\sqrt{3}}{2}v$

② v

③ $\frac{2v}{\sqrt{3}}$

④ $v/_2$

18. A passenger train of length 60 m travels at a speed of 80 km/hr. Another freight train of length 120 m travels at a speed of 30 km/hr. The ratio of times taken by the passenger train to completely cross the freight train when: (i) they are moving in the same direction and (ii) in the opposite direction is [4]

① $\frac{3}{2}$

② $\frac{25}{11}$

③ $\frac{11}{5}$

④ $\frac{5}{2}$

19. A boat which has a speed of 5 km/h in still water crosses a river of width 1 km. along the shortest possible path in 15 min. The velocity of the river water in km/h is [4]

① 1   ② 3   ③ 4   ④ $\sqrt{41}$

20. All the graphs below are intended to represent the same motion. One of them does it incorrectly. [4]
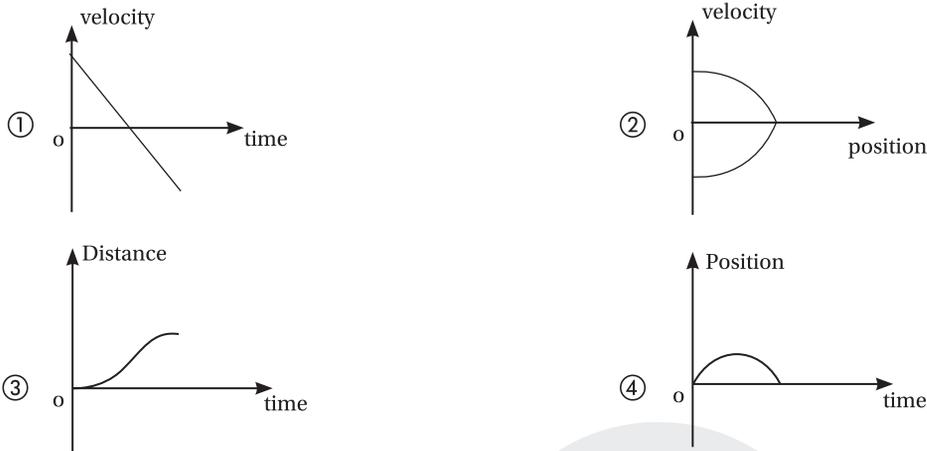
SECTION B

Section B consists of 5 questions of 4 marks each.

21. The position vector of a particle is $r(t) = \left(\dfrac{10}{3}t^3 \hat{i} + 5t^2 \hat{j} \right)$ m. At t = 1s, the velocity of particle is $x\sqrt{2}$ m/s. Then x is _____ [4]

22. A particle starts from rest. Its acceleration (a) versus time (t) is as shown figure. The maximum speed of the particle will be x m/s. Then x is _____ . [4]
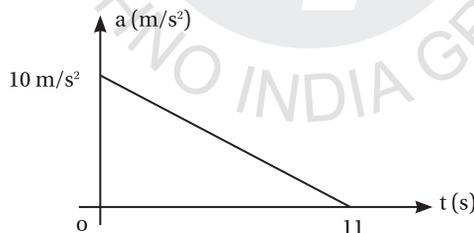
23. Position of particle is, $x(t) = at + bt^2 - ct^3$ the acceleration is zero, when $t = \dfrac{b}{nc}$ then n is _____ . [4]

24. The position vector of particle changes with time according to the relation $r(t) = 15t^2\,\hat{i} + (4 - 20t^2)\hat{j}$. . The magnitude of acceleration (in m/s^2) at t = 1s is _____ . [4]

25. A particle starts from the origin at time t = 0s and moves along the positive x-axis. The graph of velocity with respect to time is shown in figure. What is the position of the particle at time t = 5s. [4]

Cont...6
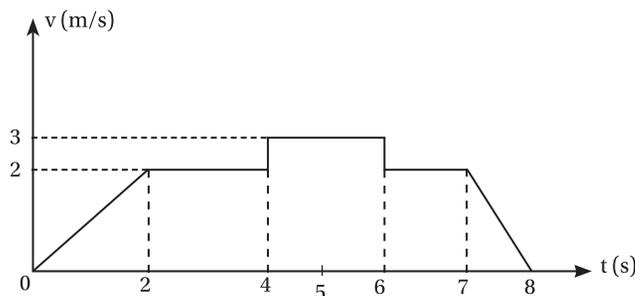
CHEMISTRY

SECTION A

Section A consists of 20 questions of 4 marks each.

26. The density of $4\%\left(\dfrac{W}{V}\right)$ NaOH solution is 1.02 g/mL. What is the molality of the solution? [4]

    ① 1.89 m   ② 1.02 m   ③ 2.8 m   ④ 5 m

27. Calculate the molarity of a solution of ethanol in water in which the mole fraction of ethanol is 0.04.

    [Given $dH_2O = 1$ g/cl]

    ① 2.1 M   ② 0.04 M   ③ 5.55 M   ④ 4 M

28. $CaCO_3$ is 90% pure. Volume of CO_2 collected at S.T.P when 10 g of $CaCO_3$ is decomposed, is [4]

    ① 20.16 L   ② 1.008 L   ③ 2.96 L   ④ 2.016 L

29. In a gas phase reaction, 50 kg of Nitrogen and 10 kg of Hydrogen are mixed to produce ammonia. The maximum amount of ammonia produced is: [4]

    ① 46.67 kg   ② 50 kg

    ③ 56.67 kg   ④ 10 kg

30. The molarity of a solution obtained by mixing 750 ml of 0.5 (M) HCl with 250 ml of 2(M) HCl will be: [4]

    ① 0.975 M   ② 0.875 M

    ③ 1.00 M   ④ 1.75 M

31. What is the work function (W) of the metal whose threshold frequency (2s) is $5.2 \times 10^4\,s^{-1}$? [4]

    ① 4.33×10^{-19} J   ② 4.33×10^{-9} J

    ③ 3.44×10^{-19} J   ④ 3.44×10^{-9} J

32. A 100 watt bulb emits monochromatic light of wavelength 400 nm. Calculate the number of photons emitted per second by the bulb. [4]

    ① $2 \times 10^{+10}$ photons per sec   ③ $2 \times 10^{+25}$ photons per sec

    ⓒ 2×10^5 photons per sec   ④ 2×10^{20} photons per sec

33. The energy of hydrogen atom in the ground state is –13.6 eV. Its energy corresponding to the quantum number n = 5 is: [4]

    ① – 0.54 eV   ② –5.40 eV

    ③ –0.85 eV   ④ –2.72 eV

34. The correct set of quantum numbers for the unpaired electron of chlorine atom is: [4]

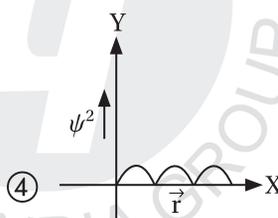   ① $n = 2, l = 1, m = 0$ ② $n = 2, l = 1, m = 1$

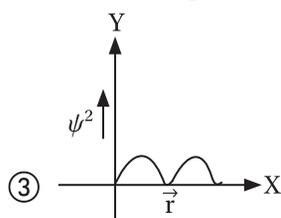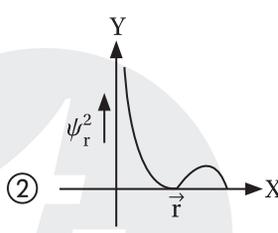   ③ $n = 3, l = 1, m = 1$ ④ $n = 3, l = 0, m = 0$

35. Graph of incident frequency with stopping potential in photoelectric effect is: [4]

① [graph: v vs $\vec{v_S}$, line with positive slope starting above origin]

⑧ [graph: v vs $\vec{v_S}$, line with positive slope starting from x-axis]

③ [graph: v vs $\vec{v_S}$, line with slight negative slope from Y-axis]

④ [graph: v vs $\vec{v_S}$, line with negative slope]
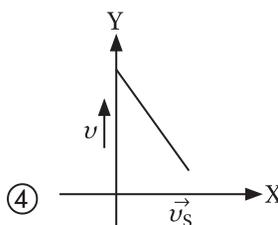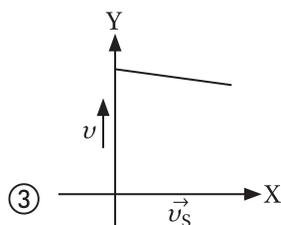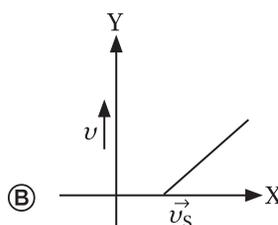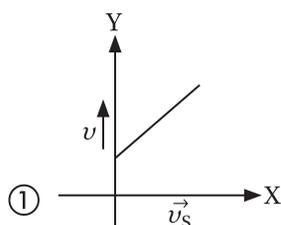
36. Which of the following graph is correct for 3p? [4]

① [graph: ψ^2 vs $\vec{r}$]

② [graph: ψ_r^2 vs $\vec{r}$]

③ [graph: ψ^2 vs $\vec{r}$]

④ [graph: ψ^2 vs $\vec{r}$]
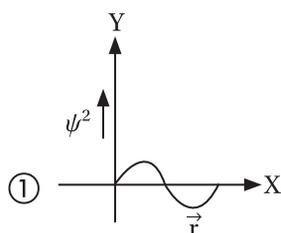
37. A piece of Mg is dissolved in 40 ml of $\frac{N}{10}$ HCl completely. The excess of acid was neutralized by 15 ml of $\frac{N}{5}$ NaOH. The weight of Mg is: [4]

① 0.24 g　　　② 0.024 g　　　③ 0.012 g　　　④ 0.40 g

38. The energy required to break one mole of Cl–Cl bonds in Cl_2 is 242 KJ (mole)$^{-1}$. The longest wavelength of light capable of breaking a single Cl–Cl bond is ($C = 3 \times 10^8$ m/s) and $Na = 6.02 \times 10^{23}$ mole^{-1}). [4]

① 494 nm　　　② 594 nm　　　③ 640 nm　　　④ 700 nm

39. The correct set of form quantum numbers for the valence electron of rubidium atom (Z = 37) is: [4]

① $5, 0, 1, +\frac{1}{2}$　　② $5, 0, 0, +\frac{1}{2}$　　③ $5, 1, 0, +\frac{1}{2}$　　④ $5, 1, 1, +\frac{1}{2}$

40. Uncertainty in position of a minute particle of mass 25 g in space is 10^{-5} m. What is the uncertainty in its velocity (in ms^{-1}), ($h = 6.6 \times 10^{-34}$ J : S) [4]

① 2.1×10^{-34}　　② 0.5×10^{-34}　　③ 2.1×10^{-28}　　④ 0.5×10^{-23}

41. Which one of the following ions has the highest value of ionic radius? [4]

① Li^+　　　② B^{3+}　　　③ O^{2-}　　　④ $F^{\ominus}$

42. The increasing order of atomic radii of the following group 13 elements is: [4]

① Al < Ga < In < Tl ② Ga < Al < In < Tl ③ Al < In < Ga < Tl ④ Al < Ga < Tl < In

43. The species having bond order different from that in CO is: [4]

① $NO^{\ominus}$ ② NO^{+} ③ $CN^{\ominus}$ ④ N_2

44. The shape of XeO_2F_2 molecule is: [4]

① Trigonal bipyramidal ② Square planar ③ Tetrahedral ④ See-Saw

45. Among the following, the paramagnetic compound is: [4]

① Na_2O_2 ② O_3 ③ N_2O ④ KO_2

SECTION B

Section B consists of 5 questions of 4 marks each.

46. 2g of a mixture of CO and CO_2 on reaction with excess I_2O_5 produce 2.54 g I_2. What would be the mass % of CO_2 in the original mixture? [4]

equation: $5CO + I_2O_5 \longrightarrow 5CO_2 + I_2$ _____

47. In a sample, electron jumps from 5th excited state to ground state then number of spectral lines in visible range will be: _____ [4]

48. How many electrons with $\ell = 2$, are there in an atom having atomic number 54? _____ [4]

49. Electronegativity of an element on Mulliken Scale is 'X' times to that on Pauling scale. What is the value of 'X'? (Nearest whole number) _____ [4]

50. The Zeffective for He is: (Nearest whole number). _____ [4]

Mathematics

SECTION A

Section A consists of 20 questions of 4 marks each.

51. The number of solutions of $\log_4(x-1) = \log_2(x-3)$ is [4]

Ⓐ 3 Ⓑ 2 Ⓒ 1 Ⓓ 0

52. Let $S = \left\{ x \mid x \in R \text{ and } x^2 + 4 = \log_{10} x \right\}$, then $n(s) = ?$ [4]

Ⓐ 2 Ⓑ 1 Ⓒ 0 Ⓓ none of these

53. If $\dfrac{\log_{10} a}{b-c} = \dfrac{\log_{10} b}{c-a} = \dfrac{\log_{10} c}{a-b}$ find $a^{b+c} \cdot b^{c+a} \cdot c^{a+b} = ?$ [4]

Ⓐ 1 Ⓑ 2 Ⓒ 3 Ⓓ 4

54. Let α be a principal square root of $x^2 - 4 = 0$ and $\beta = \dfrac{1}{\log_3 \pi} + \dfrac{1}{\log_4 \pi}$ then [4]

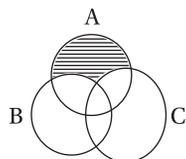Ⓐ $\dfrac{\alpha}{\beta} > 1$ Ⓑ $\dfrac{\alpha}{\beta} < 1$ Ⓒ $\dfrac{\alpha}{\beta} = 1$ Ⓓ none of these

55. If A = {1, 2, 3, 4}, then the number of subsets of set A containing element 3 is   [4]

  Ⓐ 24   Ⓑ 28   Ⓒ 8   Ⓓ 16

56. Set A and B have 3 and 6 elements respectively. What can be the minimum number of elements in A∪B.   [4]

  Ⓐ 3   Ⓑ 6   Ⓒ 9   Ⓓ 18

57. The shaded region in the given figure is :   [4]

  Ⓐ $A \cap (B \cup C)$ Ⓑ $A \cup (B \cap C)$ Ⓒ $A \cap (B - C)$ Ⓓ $A - (B \cup C)$

58. If class with n students is organised into four groups and each pair of groups keeping the following conditions : Each student belongs to exactly two groups and each pair of groups has exactly one student in common. Then n = ?   [4]

  Ⓐ n = 11   Ⓑ n = 7   Ⓒ n = 9   Ⓓ n = 6

59. Let S = {1, 2, 3, ... , 100}. The number of non-empty subsets A of S such that the product of elements in A is even is   [4]

  Ⓐ $2^{50} + 1$ Ⓑ $2^{50}(2^{50} - 1)$ Ⓒ $2^{50} - 1$ Ⓓ $2^{100} - 1$

60. A class has 175 students. The following data shows the number of students obtaining one or more subjects. Mathematics 100 ; Physics 70; Chemistry 40 ; Mathematics and Physics 30, Mathematics and Chemistry 28, Physics and Chemistry 23, Mathematics, Physics and Chemistry 18. How many students have offered Mathematics alone ?   [4]

  Ⓐ 35   Ⓑ 48   Ⓒ 60   Ⓓ 22

61. Let Y = {1, 2, 3, 4, 5}, A = {1, 2}, B = {3, 4, 5} ane φ denote the null set. If A × B denotes the Cartesian product of sets A and B, then $(Y \times A) \cap (Y \times B)$ is   [4]

  Ⓐ Y   Ⓑ A   Ⓒ B   Ⓓ φ

62. If $n(A \cap B) = 99$ then $n((A \times B) \cap (B \times A)) = ?$ [4]

  Ⓐ 99   Ⓑ 99^2 Ⓒ 99^3 Ⓓ 99^4

63. Let R be a relation on set of real numbers (R) defined by $R = \{(a, b) : a = b^3$ and a, b are real numbers$\}$. Find the rang of R.   [4]

  Ⓐ Q   Ⓑ Q'   Ⓒ ℝ   Ⓓ Z

64. Let, $g(x) = \begin{cases} x^2, & 0 \le x \le 2 \\ 3x, & 2 \le x \le 10 \end{cases}$ then,   [4]

  Ⓐ g is a relation   Ⓑ g is a function   Ⓒ Neither (A) nor (B)   Ⓓ Data insufficiency

65. Let a, b c $\in$ R. If f(x) = ax^2 + bx + c is such that a + b + c = 3 and f(x + y) = f(x) + f(y) + xy for all x, y, $\in$R, then

$\displaystyle\sum_{n=1}^{10} f(n)$ is equal to [4]

Ⓐ 190 Ⓑ 255 Ⓒ 330 Ⓓ 165

66. Let g(x) is a polynomial function satisfying g(x).g(y) = g(x) + g(y) + g(xy) – 2 for all x, y $\in$R. If g(2) = 5 then g(5) = ? [4]

Ⓐ 6 Ⓑ 25 Ⓒ 24 Ⓓ 26

67. Find the domain of definition of function $\dfrac{1}{\sqrt{[x]^2 - [x] - 6}}$ is [4]

Ⓐ (-∞, – 2) $\cup$ [4, ∞) Ⓑ (-∞, – 2] $\cup$ [4, ∞) Ⓒ (-∞, – 2) $\cup$ (4, ∞) Ⓓ none of these

68. The value of $(\sin 70°)(\cot 10° \cot 70° - 1)$ is [4]

Ⓐ 1 Ⓑ 0 Ⓒ $\dfrac{3}{2}$ Ⓓ $\dfrac{2}{3}$

69. If $\sin x = -\dfrac{3}{5}$ where $\pi < x < \dfrac{3\pi}{2}$, then 80 (tan^{2}x – cos x) is equal to [4]

Ⓐ 109 Ⓑ 108 Ⓒ 18 Ⓓ 19

70. If the value of $\dfrac{3\cos 36^0 + 5\sin 18^0}{5\cos 36^0 - 3\sin 18^0}$ is $\dfrac{a\sqrt{5} - b}{c}$, where a, b, c are natural numbers gcd (a, c) = 1, then a + b + c is equal to : [4]

Ⓐ 50 Ⓑ 40 Ⓒ 52 Ⓓ 54

SECTION B

Section B consists of 5 questions of 4 marks each.

71. In a triangle ABC, BC = 7, AC = 8, AB $\in$ N and $\cos A = \dfrac{2}{3}$. If 49 cos(3c) + 42 = $\dfrac{m}{n}$, where gcd (m, n) = 1, then (m + n) is equal to : [4]

72. If $\dfrac{\sqrt{2}\sin\alpha}{\sqrt{1+\cos 2\alpha}} = \dfrac{1}{7}$ and $\sqrt{\dfrac{1-\cos 2\beta}{2}} = \dfrac{1}{\sqrt{10}}$ and, α, β$\in$(0, $^\pi/_2$), then (α + 2β) is equal to [4]

73. The value of tan 9° – tan 27° – tan 63° + tan 81° is [4]

74. The value of $6 + \log_{\frac{3}{2}}\left(\dfrac{1}{3\sqrt{2}}\sqrt{4 - \dfrac{1}{3\sqrt{2}}\sqrt{4 - \dfrac{1}{3\sqrt{2}}\sqrt{4 - \dfrac{1}{3\sqrt{2}}\ldots}}}\right)$ is [4]

75. If the range of the function $f(x) = \dfrac{x^2 + x + 2}{x^2 + x + 1}$; x$\in$R is $\left(1, \dfrac{m}{n}\right]$ where gcd (m,n) = 1, then (m – 2n) is equal to [4]