**ACTIVE SITE TUTORIALS**

**Date :** 07-09-2019 **TEST ID: 614**

**Time :** 08:39:00 **MATHEMATICS**

**Marks :** 515

9.DIFFERENTIAL EQUATIONS

**Single Correct Answer Type**

| 1. | The solutions of is | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 2. | The solution of the differential equation is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 3. | An integrating factor of the differential equation is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 4. | The solution of the differential equation  where as is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 5. | Tangent to a curve intercepts the -axis at a point . A line perpendicular to this tangent through passes through another point (1, 0). The differential equation of the curve is | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) | None of these | | | | | | | |
| 6. | The solution of the differential equation is given by | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) | None of these | | |
| 7. | The integrating factor of the differential equation is given by | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 8. | The solution of the differential equation | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 9. | The differential equation whose general solution is given by, where are arbitrary constants, is | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 10. | A differential equation associated to the primitive is (where is th derivative w.r.t. )  Where represents th order derivative | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) | None of these | | |
| 11. | The curve satisfying the equation and passing through the point is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 12. | The solution of the equation is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 13. | The solution of the differential equation where is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 14. | The general solution of the differential equation is | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 15. | The curve, with the property that the projection of the ordinate on the normal is constant and has a length equal to is | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 16. | The degree of the differential equation satisfying is | | | | | | | |
|  | a) | 1 | b) | 2 | c) | 3 | d) | None of these |
| 17. | If and , then equals | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 18. | The solution of the differential equation  given is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 19. | A normal at any point to the curve cuts a triangle of unit area with the axis, the differential equation of the curve is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 20. | Solution of is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 21. | An object falling from rest in air is subject not only to the gravitational force but also to air resistance. Assume that the air resistance is proportional to the velocity with constant of proportionality as , and acts in a direction opposite to motion . Then velocity cannot exceed | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 22. | The family of curves represented by and | | | | | | | |
|  | a) | Touch each other | b) | Are orthogonal | c) | Are one and the same | d) | None of these |
| 23. | The solution of differential equation  is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 24. | A normal at on a curve meets the -axis at and is the foot of the ordinate at . If , then the equation of curve given that it passes through the point (3, 1) is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 25. | The solution of the differential equation when and is | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) | None of these | | |
| 26. | The solution of is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 27. | The solution of is | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) | None of these | | |
| 28. | If , then is equal to | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 29. | Differential equation of the family of circles touching the line at (0, 2) is | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) | None of these | | |
| 30. | The solution of the differential equation is | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) | None of these | | | | | | | |
| 31. | The -intercept of the tangent to a curve is equal to the ordinate of the point of contact. The equation of the curve through the point (1, 1) is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 32. | Integrating factor of differential equation  is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 33. | The solution of satisfying is given by | | | | | | | |
|  | a) | A system of parabolas | | | b) | A system of circles | | |
|  | c) |  | | | d) |  | | |
| 34. | Which of the following is not the differential equation of family of curves whose tangent form an angle of with the hyperbola ? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 35. | The population of a country increases at a rate proportional to the number of inhabitants. is the population which doubles in 30 years, then the population will triple in approximately | | | | | | | |
|  | a) | 30 years | b) | 45 years | c) | 48 years | d) | 54 years |
| 36. | The general solution of the equation is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 37. | The form of the differential equation of the central conics is | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) | None of these | | |
| 38. | A curve passing through (2, 3) and satisfying the differential equation   is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 39. | If is a solution of and , then is equal to | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 40. | Solution of the differential equation is | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) | None of these | | |
| 41. | The solution of differential equation is | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 42. | The solution of the differential equation  is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 43. | A curve is such that the mid point of the portion of the tangent intercepted between the point where the tangent is drawn and the point where the tangent meets the -axis lies on the line . If the curve passes through (1, 0), then the curve is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 44. | If (where is an arbitrary constant) is the general solution of the differential equation then the function is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 45. | The solution of is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 46. | Solution of differential equation is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 47. | The differential equation whose solution is where and are arbitrary constants, is of | | | | | | | |
|  | a) | Second order and second degree | | | b) | First order and second degree | | |
|  | c) | First order and first degree | | | d) | Second order and first degree | | |
| 48. | The solution of the differential equation  is | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 49. | The solution of the differential equation  is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 50. | If , where , then is expressed explicitly as | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 51. | The differential equation of the family of curves where and are arbitrary constants, is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 52. | The solution of the equation is | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 53. | Solution of the equation , when is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 54. | The solution of the differential equation  is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 55. | The function satisfies the differential equation | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 56. | The solution to the differential equation , where is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 57. | The differential equation determines a family of circles with | | | | | | | |
|  | a) | Variable radii and a fixed centre t (0,1) | | | | | | | |
|  | b) | Variable radii and a fixed centre at (0,-1) | | | | | | | |
|  | c) | Fixed radius 1 and variable centres along the x-axis | | | | | | | |
|  | d) | Fixed radius 1 and variable centres along the y-axis | | | | | | | |
| 58. | The solution of the differential equation  is equal to | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) | None of these | | | | | | | |
| 59. | If then the solution of the equation is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 60. | If integrating factor of  is , then is equal to | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 61. | The solution of the equation  is given by | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) | None of these | | | | | | | |
| 62. | A function satisfies  If , then is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 63. | The curve for which the normal at any point and the line joining the origin to that point form an isosceles triangle with the -axis as base is | | | | | | | |
|  | a) | An ellipse | | | b) | A rectangular hyperbola | | |
|  | c) | A circle | | | d) | None of these | | |
| 64. | Orthogonal trajectories of family of the curve , where is any arbitrary constant, is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 65. | The slope of the tangent at to a curve passing through a point (2, 1) is , then the equation of the curve is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 66. | The normal to a curve at meets the -axis at . If the distance of from the origin is twice the abscissa of , then the curve is a | | | | | | | |
|  | a) | Parabola | b) | Circle | c) | Hyperbola | d) | Ellipse |
| 67. | The solution of is | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) |  | | | | | | | |
| 68. | The differential equation of the curve for which the initial ordinate of any tangent is equal to the corresponding subnormal | | | | | | | |
|  | a) | Is linear | | | b) | Is homogenous of second degree | | |
|  | c) | Has separable variables | | | d) | Is of second order | | |
| 69. | If , then one of the values of satisfying is given by | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 70. | The equation of the curves through the point (1, 0) and whose slope is is | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) | None of these | | |
| 71. | If and then equals | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | 1 |
| 72. | The slope of the tangent at to a curve passing through is given by , then the equation of the curve is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 73. | The differential equation of all non-horizontal lines in a plane is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 74. | The equation of a curve passing through (2, 7/2) and having gradient at is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 75. | The differential equation of the curve is given by | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) | None of these | | |
| 76. | Solution of the differential equation  is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 77. | The solution of the equation is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 78. | Differential equation of the family of curves , where and are arbitrary constant, is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 79. | Number of values of for which is a solution of the differential equation | | | | | | | |
|  | a) | 0 | b) | 1 | c) | 2 | d) | More than 2 |
| 80. | The differential equation of all circles which pass through the origin and whose centres lie on the -axis is | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 81. | The differential equation for the family of curve where is an arbitrary constant, is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 82. | If is a solution of and then is equal to | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 83. | The solution of is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 84. | The equation of a curve passing through (1, 0) for which the product of the abscissa of a point and the intercept made by a normal at on the -axis equals twice the square of the radius vector of the point , is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 85. | The solution of the differential equation is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 86. | The solution of the differential equation  is | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) | None of these | | | | | | | |
| 87. | The solution of differential equation is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 88. | Spherical rain drop evaporates at a rate proportional to its surface area. The differential equation corresponding to the rate of change of the radius of the rain drop if the constant of proportionality is is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 89. | Water is drained from a vertical cylindrical tank by opening a valve at the base of the tank. It is known that the rate at which the water level drops is proportional to the square root of water depth , where the constant of proportionality depends on the acceleration due to gravity and the geometry of the hole. If is measured in minutes and , then the time to drain the tank if the water is 4 m deep to start with is | | | | | | | |
|  | a) | 30 min | b) | 45 min | c) | 60 min | d) | 80 min |
| 90. | The solution of differential equation  is | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 91. | The differential equation of all parabolas each of which has a latus rectum and whose axis are parallel to the -axis is | | | | | | | |
|  | a) | Of order 1 and degree 2 | | | b) | Of order 2 and degree 3 | | |
|  | c) | Of order 2 and degree 1 | | | d) | Of order 2 and degree 2 | | |
| 92. | The equation of the curve which is such that the portion of the axis of cut off between the origin and tangent at any point is proportional to the ordinate of that point is  ( is a constant of proportionality) | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 93. | The differential equation of all parabolas whose axis are parallel to the -axis is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 94. | The general solution of the differential equation,  where is a known function, is | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |

**Multiple Correct Answers Type**

| 95. | Which one of the following function(s) is/are homogeneous? | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) |  | | | | | | | |
| 96. | The curve is such that the area of the trapezium formed by the coordinate axes, ordinate of an arbitrary point and the tangent at this point equals half the square of its abscissa. The equation of the curve can be | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 97. | The solution of the differential equation  is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 98. | is a solution of then | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) | takes finite number of values | | |
| 99. | The differential equation representing the family of curves , where is a positive parameter, is of | | | | | | | |
|  | a) | Order 1 | b) | Order 2 | c) | Degree 3 | d) | Degree 4 |
| 100. | The equation of the curve satisfying the differential equation passing through the point (0, 1) and having slope of tangent at as 3 (where and ) represents 2nd and 1st order derivative), then | | | | | | | |
|  | a) | is a strictly increasing function | | | b) | is a non-monotonic function | | |
|  | c) | has three distinct real roots | | | d) | has only one negative root | | |
| 101. | The equation of the curve satisfying the differential equation can be a | | | | | | | |
|  | a) | Circle | b) | Straight line | c) | Parabola | d) | Ellipse |
| 102. | The tangent at any point on meets -axis and -axis at respectively. If , then the equation of the curve, is | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) | (where is arbitrary constant) | | |
| 103. | The curves for which the length of the normal is equal to the length of the radius vector is/are | | | | | | | |
|  | a) | Circles | | | b) | Rectangular hyperbola | | |
|  | c) | Ellipse | | | d) | Straight lines | | |
| 104. | The solution of represents a parabola if | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 105. | A curve passes through the point . The normal to the curve at is a . If the slope of the tangent at any point on the curve is proportional to the ordinate of the point, then the equation of the curve is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 106. | The solution of the differential equation  is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 107. | For the differential equation whose solution is is a constant), is | | | | | | | |
|  | a) | Order is 2 | b) | Order is 3 | c) | Degree is 2 | d) | Degree is 3 |
| 108. | If be twice differential functions on [0, 2] satisfying and , then | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) | has real root | | |
| 109. | Identify the statement(s) which is/are true | | | | | | | |
|  | a) | is a homogeneous of degree zero | | | | | | | |
|  | b) | is a homogeneous differential equation | | | | | | | |
|  | c) | is a not homogeneous | | | | | | | |
|  | d) | is a homogeneous differential equation | | | | | | | |
| 110. | In which of the following differential equation degree is not defined? | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 111. | The solution of represents a parabola when | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 112. | The solution of is | | | | | | | |
|  | a) |  | | | b) | constant } | | |
|  | c) | constant} | | | d) |  | | |
| 113. | The solution of is | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) |  | | | | | | | |
| 114. | The graph of the function passing through the point (0, 1) and satisfying the differential equation is such that | | | | | | | |
|  | a) | It is a constant function | | | b) | It is periodic | | |
|  | c) | It is neither an ever nor an odd function | | | d) | It is continuous and differentiable for all | | |
| 115. | Which of the following equation(s) is/are linear? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| 116. | For equation of the curve whose subnormal is constant, then | | | | | | | |
|  | a) | Its eccentricity is 1 | b) | Its eccentricity is | c) | Its axis is the -axis | d) | Its axis is the -axis |
| 117. | The order of the differential equation whose general solution is given by where , are arbitrary constants, is | | | | | | | |
|  | a) | 5 | b) | 4 | c) | 3 | d) | 2 |
| 118. | The solution of is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Assertion - Reasoning Type** | | | |
| This section contain(s) 0 questions numbered 119 to 118. Each question containsstatement 1(Assertion) and statement 2(Reason). Each question has the 4 choices (a), (b), (c) and (d) out of which **only one** is correct. | | | |
|  | a) | Statement 1 is True, Statement 2 is True; Statement 2 **is** correct explanation for Statement 1 | |
|  | b) | Statement 1 is True, Statement 2 is True; Statement 2 **is not** correct explanation for Statement 1 | |
|  | c) | Statement 1 is True, Statement 2 is False | |
|  | d) | Statement 1 is False, Statement 2 is True | |

|  |  |  |  |
| --- | --- | --- | --- |
| 119 |  | | |
|  | **Statement 1:** | | The value of , if satisfies is |
|  | **Statement 2:** | | The solution of linear equation can be obtained by multiplying with the factor |

|  |  |  |  |
| --- | --- | --- | --- |
| 120 |  | | |
|  | **Statement 1:** | | Degree of the differential equation is not defined |
|  | **Statement 2:** | | In the given differential equation, the power of highest order derivative when expressed as the polynomials of derivatives is called degree |

|  |  |  |  |
| --- | --- | --- | --- |
| 121 |  | | |
|  | **Statement 1:** | | The differential equation of all circles in a plane must be of order 3 |
|  | **Statement 2:** | | There is only one circle passing through three non –collinear points |

|  |  |  |  |
| --- | --- | --- | --- |
| 122 |  | | |
|  | **Statement 1:** | | Order of the differential equation whose solutions is is 4. |
|  | **Statement 2:** | | Order of the differential equation is equal to the number of independent arbitrary constant mentioned in the solution of differential equation. |

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| 123 |  | | |
|  | **Statement 1:** | | The elimination of four arbitrary constants in results into a differential equation of the first order . |
|  | **Statement 2:** | | Elimination of arbitrary constants requires in general, a differential equation of the order. |

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| 124 | Let a solution of the differential equation satisfy | | |
|  | **Statement 1:** | |  |
|  | **Statement 2:** | | is given by |

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| --- | --- | --- | --- |
| 125 |  | | |
|  | **Statement 1:** | | The differential equation of the family of curves represented by is given by |
|  | **Statement 2:** | | is valid for every member of the given family |

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| 126 |  | | |
|  | **Statement 1:** | | The differential equation of the form can be converted to homogeneous forms by substitution |
|  | **Statement 2:** | | All differential equation of first order and first degree become homogeneous, if we put |

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| 127 |  | | |
|  | **Statement 1:** | | The differential equation of all circles in a plane must be of order 3. |
|  | **Statement 2:** | | If three point are non-collinear, then only one circle always passing through these points. |

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| 128 |  | | |
|  | **Statement 1:** | | The equation of curve passing through (3, 9) which satisfies differential equation is |
|  | **Statement 2:** | | The solution of differential equation is . |

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| 129 |  | | |
|  | **Statement 1:** | | The degree of the differential equation is 2. |
|  | **Statement 2:** | | The degree of a differential equation which can be written as polynomial in the derivatives is the degree of the derivatives of the highest order occurring in it. |

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| 130 |  | | |
|  | **Statement 1:** | | The order of the differential equation whose general solution is is 3 |
|  | **Statement 2:** | | Total number of arbitrary parameters in the given general solution in the statement (1) is 3 |

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| 131 |  | | |
|  | **Statement 1:** | | Order of a differential equation represents number of arbitrary constants in the general solution |
|  | **Statement 2:** | | Degree of a differential equation represents number of family of curves |

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| 132 |  | | |
|  | **Statement 1:** | | is a general solution of . |
|  | **Statement 2:** | | is a trigonometric function. |

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| **Matrix-Match Type** | | | | | | | | | |
| This section contain(s) 0 question(s). Each question contains Statements given in 2 columns which have to be matched. Statements (A, B, C, D) in **columns I** have to be matched with Statements (p, q, r, s) in **columns II**. | | | | | | | | | |

| 133. |  | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Order 1 | | (p) | | Of all parabolas whose axis is the -axis | |
|  | **(B)** | Order 2 | | (q) | | Of family of curves , where is an arbitrary constant | |
|  | **(C)** | Degree 1 | | (r) | |  | |
|  | **(D)** | Degree 3 | | (s) | | Of family of curve , where | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | Q,s | p | p | q,r,s |  |  |
|  | **b)** | p | q,r,s | p | q,s |  |  |
|  | **c)** | q,r,s | p | q,s | p |  |  |
|  | **d)** | p | q,s | q,r,s | p |  |  |

| 134. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | If the function is a solution of the differential equation , then the value of is | | (p) | | 3 | |
|  | **(B)** | Number of straight lines which satisfy the differential equation is | | (q) | | 4 | |
|  | **(C)** | If real value of for which the substitution, will transform the differential equation, into a homogeneous equation, then the value of is | | (r) | | 2 | |
|  | **(D)** | If the solution of differential equation is , then is | | (s) | | 1 | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | r | p | s | q |  |  |
|  | **b)** | q | r | p | s |  |  |
|  | **c)** | p | s | q | r |  |  |
|  | **d)** | s | q | r | p |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Linked Comprehension Type**  This section contain(s) 10 paragraph(s) and based upon each paragraph, multiple choice questions have to be answered. Each question has atleast 4 choices (a), (b), (c) and (d) out of which **only one** is correct.  **Paragraph for Question Nos. 135 to -135** | | | | | | | | |
| Newton’s law of cooling states that rate at which a substance cools in moving air is proportional to the difference between the temperatures of the substance and that of the air. If the temperature of the air is 290 K.We can write as dTdt=-kT-290, k>0 constants, where T is temperature of substance.on the basis of above information, anseer the following questions : | | | | |

| 135. | The substance cools from 370 K to 330 K in 10 min, then | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| **Paragraph for Question Nos. 136 to - 136** | | | | | | | | |

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| A right circular cone with radius R and height H contains a liquid which evaporates at a rate proportional to its surface area in contact with air (proportionally constant =k>0). Suppose that r(t) is the radius of liquid cone at time t.on the basis of above information, anseer the following questions : | | | | |

| 136. | The time after which the cone is empty, is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| **Paragraph for Question Nos. 137 to - 137** | | | | | | | | |

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| Let f(x) be a non-positive continuous function and Fx=0xf(t)dt ∀ x≥0 and fx≥cF(x) where c>0 and let g:[0, ∞)→R be a function such that dg(x)dx<gx ∀x>0 and g0=0 | | | | |

| 137. | The total number of root(s) of the equation is/are | | | | | | | |
|  | a) |  | b) | 1 | c) | 2 | d) | 0 |
| **Paragraph for Question Nos. 138 to - 138** | | | | | | | | |

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| The differential equation y=px+fp, (1)Where p=dydx, is known as Clairout’s Equation. To solve equation (1), differentiate it with respect to x, which gives eitherdpdx=0⇒p=c (2)Or x+f''p=0 (3)Note:a. If p is eliminated between equation 1and 2,the solution obtained is ageneral solution of equation (1),b. If p is eliminated between equation 1and 3, then solution obtained doesnot contain any arbitrary constant and is not particular solution of equation1. This solution is calledsingular solution of equation (1) | | | | |

| 138. | Which of the following is true about solutions of differential equation | | | | | | | |
|  | a) | The general solution of equation is family of parabolas | | | | | | | |
|  | b) | The general solution of equation is family of circles | | | | | | | |
|  | c) | The singular solution of equation is circle | | | | | | | |
|  | d) | The singular solution of equation is ellipse | | | | | | | |
| **Paragraph for Question Nos. 139 to - 139** | | | | | | | | |

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| For certain curves y=f(x) satisfying d2ydx2=6x-4, f(x) has local minimum value 5 when x=1 | | | | |

| 139. | Number of critical point for for | | | | | | | |
|  | a) | 0 | b) | 1 | c) | 2 | d) | 3 |
| **Paragraph for Question Nos. 140 to - 140** | | | | | | | | |

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| A certain radioactive material is known to decay at a rate proportional to the amount present. Initially there is 50 kg of the material present and after two hours it is observed that the material has lost 10 percent of its original mass. Based on these data answer the following questions | | | | |

| 140. | The expression for the mass of the material remaining at any time | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None of these |
| **Paragraph for Question Nos. 141 to - 141** | | | | | | | | |

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| Consider a tank which initially holds V0ltr. of brine that contains a lbof salt. Another brine solution, containing b lb of salt/ltr., is poured into the tank at the rate of e ltr./min while, simultaneously, the well-stirred solution leaves the tank at the rate of f ltr./min. The problem is to find the amount of salt in the tank at any time tLet Q denote the amount of salt in the tank at any time. The time rate of change of Q, dQ/dt, equals the rate at which salt enters the tank minus the rate at which salt leaves the tank. Salt enters the tank at the rate of be lb/min. To determine the rate at which salt leaves the tank, we first calculate the volume of brine in the tank at any time t, which is the initial volume V0 plus the volume of brine added et minus the volume of brine removed ft. Thus, the volume of brine at any time isV0+et-ft (a)The concentration of salt in the tank at any time is Q/(V0+et-ft), from which it follows that salt leaves the tank at the rate of f QV0+et-ftlb/minThus, dQdt=be-fQV0+et-ft (b)Or dQdt+fV0+et-ftQ=be | | | | |

| 141. | A tank initially holds 100 ltr. Of a brine solution containing 20 lb of salt. At , fresh water is poured into the tank at the rate of 5 ltr./min, while the well-stirred mixture leaves the tank at the same rate. Then the amount of salt in the tank after 20 min | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |

**Integer Answer Type**

| 142. | The perpendicular from the origin to the tangent at any point on a curve is equal to the abscissa of the point contact. Also curve passes through the point (1, 1). Then the length of intercept of the curve on the -axis is | | | | | | | |
| 143. | If , then equals | | | | | | | |
| 144. | The curve passing through the point (1, 1) satisfies the differential equation . If the curve passes through the point then the value of is (where represents greatest integer function) | | | | | | | |
| 145. | If the solution of the differential equation is , then the value of is | | | | | | | |
| 146. | Tangent is drawn at the point on the curve , which intersects the -axis at . Now, again a tangent is drawn at on the curve which intersect the -axis at and the process is repeated times, i.e., . If form an arithmetic progression with common difference equal to and curve passes through (0, 2). Now if curve passes through the point , then the value of is | | | | | | | |
| 147. | If the solution of the differential equation and has a finite value, when , then the value of is | | | | | | | |
| 148. | If and it follows the relation , then is equal to | | | | | | | |
| 149. | Let be a solution to the differential equation , then is | | | | | | | |
| 150. | If the eccentricity of the curve for which tangent at point intersects the -axis at such that the point of tangency is equidistant from and the origin is , then the value of is | | | | | | | |
| 151. | If the independent variable is changed to , then the differential equation is changed to where equals | | | | | | | |
| 152. | If the dependent variable is changed to ‘’ by the substitution and the differential equation is changed to , then the value of equals | | | | | | | |

**ACTIVE SITE TUTORIALS**

**Date :** 07-09-2019 **TEST ID: 614**

**Time :** 08:39:00 **MATHEMATICS**

**Marks :** 515

9.DIFFERENTIAL EQUATIONS

|  |
| --- |
| **: ANSWER KEY :** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1) a 2) a 3) b 4) a**  **5) a 6) a 7) c 8) b**  **9) b 10) c 11) c 12) b**  **13) c 14) b 15) a 16) a**  **17) a 18) d 19) d 20) a**  **21) a 22) b 23) a 24) c**  **25) a 26) a 27) b 28) a**  **29) d 30) c 31) a 32) c**  **33) c 34) b 35) c 36) d**  **37) c 38) d 39) a 40) b**  **41) a 42) b 43) c 44) d**  **45) c 46) a 47) d 48) a**  **49) c 50) c 51) a 52) d**  **53) c 54) b 55) a 56) a**  **57) c 58) c 59) d 60) d**  **61) a 62) b 63) b 64) b**  **65) a 66) c 67) c 68) a**  **69) b 70) a 71) a 72) c**  **73) b 74) b 75) c 76) a**  **77) b 78) c 79) c 80) a**  **81) c 82) a 83) a 84) a**  **85) b 86) a 87) a 88) a**  **89) c 90) a 91) c 92) a**  **93) a 94) a 1) a,b,c 2) a,b 3) c 4) a,b**  **5) a,c 6) a,d 7) a,b 8) c,d**  **9) a,b 10) a,c 11) a 12) b**  **13) a,c 14) a,b,c 15) a,b,c 16) a,b**  **17) a,c 18) a,d 19) a,d 20) a,b,d**  **21) a,c 22) b 23) c 24) a,b,c,d**  **1) d 2) d 3) a 4) d**  **5) a 6) c 7) a 8) d**  **9) a 10) b 11) d 12) a**  **13) b 14) b 1) a 2) b 1) b 2) b 3) b 4) c**  **5) c 6) a 7) a 1) 2 2) 2 3) 3 4) 2**  **5) 8 6) 4 7) 4 8) 8**  **9) 5 10) 1 11) 2** | | | | |

**ACTIVE SITE TUTORIALS**

**Date :** 07-09-2019 **TEST ID: 614**

**Time :** 08:39:00 **MATHEMATICS**

**Marks :** 515

9.DIFFERENTIAL EQUATIONS

|  |
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| **: HINTS AND SOLUTIONS :** |

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| 1 | **(a)**  Putting , we have and the given equations reduces to | | | | | | | |
| 2 | **(a)** | | | | | | | |
| 3 | **(b)**  Given, | | | | | | | |
| 4 | **(a)**  solution is  Given  Hence equation of curve is | | | | | | | |
| 5 | **(a)**    The equation of the tangent at the point  is  The coordinates of the point are  The slope of the perpendicular line through is  which is the required differential equation to the curve at | | | | | | | |
| 6 | **(a)**  Integrating, we get  Or | | | | | | | |
| 7 | **(c)** | | | | | | | |
| 8 | **(b)** | | | | | | | |
| 9 | **(b)**  (1)  Where are arbitrary constant  (2)  (3)  (4)  From equation (5)  From equation (2) + (4), (6)  From equation (5) + (6), we get | | | | | | | |
| 10 | **(c)**  Differentiating the given equation successively, we get  (1)  (2)  (3)  Multiplying equation (1) by 7 and then adding to equation (2), we get (4)  Multiplying equation (1) by 5 and then subtracting it from equation (2),  We get (5)  Putting the values of and , obtained from equation (4) and (5), respectively, in equation (1), we get | | | | | | | |
| 11 | **(c)**  Dividing by we get  Now integrating  It passes through the point | | | | | | | |
| 12 | **(b)**  Or | | | | | | | |
| 13 | **(c)**  When and  . Integrating again  when  . Integrate again  Also when | | | | | | | |
| 14 | **(b)**  We have | | | | | | | |
| 15 | **(a)**    Ordinate Let  Projection of ordinate on normal  (given) | | | | | | | |
| 16 | **(a)**  Putting and in the given relation, we get  Differentiating. , we get  Clearly, it is a differential equation of degree one | | | | | | | |
| 17 | **(a)**  Given,      When      At , | | | | | | | |
| 18 | **(d)**  When  Equation of curve is | | | | | | | |
| 19 | **(d)**  Equation of normal at point is    Area of | | | | | | | |
| 20 | **(a)**  where  is the required solution | | | | | | | |
| 21 | **(a)**  Let be the velocity of the object at time  Given  Integrating, we get  But  Thus,  For all . Hence, cannot exceed | | | | | | | |
| 22 | **(b)**  For the family of curves represented by the first differential equation the slope of the tangent at any point is given by  For the family of curves represented by the second differential the slope of the tangent at any point is given by  Clearly,  Hence, the two curves are orthogonal | | | | | | | |
| 23 | **(a)**  The given equation can be written as  Above equation is a homogeneous equation  putting , we get  variable separable  Now integrating both sides, we get  [ constant]  Or  Or  Or | | | | | | | |
| 24 | **(c)**  Equation of normal at point    It passes through  curve is or | | | | | | | |
| 25 | **(a)**  Integrating the given differential equation, we have  But  So  Again integrating, we get  But so  Thus | | | | | | | |
| 26 | **(a)** | | | | | | | |
| 27 | **(b)**  Let  equation reduces to  where | | | | | | | |
| 28 | **(a)**  Put  . Integrating, we get  or | | | | | | | |
| 29 | **(d)**  Equation of circle will be  Differentiating, we get  the equation is | | | | | | | |
| 30 | **(c)**  The given equation can be rewritten as  (1)  Which is linear. Also  and  [resolving into partial fractions]  Hence the required solution of equation (1) is | | | | | | | |
| 31 | **(a)**  Equations of tangent is  For -intercept  According to question  Putting , we get  Given when  Hence equation of curve is | | | | | | | |
| 32 | **(c)** | | | | | | | |
| 33 | **(c)**  Rewriting the given equation as  Putting we have  solution is  Since so  Hence which represents a system of hyperbola | | | | | | | |
| 34 | **(b)**  By condition,  or | | | | | | | |
| 35 | **(c)**  Let population , at time years. Given  where is a constant of proportionality  Or. Integrating, we get  or  If initially, i.e., when time then  Given when then  (1)  To find , when triples,  (2)  Dividing equation (2) by (1) then or  years (approx) | | | | | | | |
| 36 | **(d)**  Hence solution is  is not further integrable | | | | | | | |
| 37 | **(c)**  Differentiating . , we get  (1)  Again differentiating , we get  From equation (1) and (2), we get | | | | | | | |
| 38 | **(d)**  Differentiating we get | | | | | | | |
| 39 | **(a)**  Given, and      Required solution is,      Since, | | | | | | | |
| 40 | **(b)**  The given equation is written as | | | | | | | |
| 41 | **(a)**  Putting , we get | | | | | | | |
| 42 | **(b)**  Applying componendo and divedendo  We get | | | | | | | |
| 43 | **(c)**  The point on -axis is  According to given condition,  Putting , we get  [as | | | | | | | |
| 44 | **(d)**  Differentiating | | | | | | | |
| 45 | **(c)** | | | | | | | |
| 46 | **(a)** | | | | | | | |
| 47 | **(d)**  (1)  Differentiating . , we get  (2)  Again diff. (3)  From equations (2) and (3), we get  order and degree = 1 | | | | | | | |
| 48 | **(a)**  hence the differential equation becomes  Put | | | | | | | |
| 49 | **(c)**  Re-write the D.E. as  Dividing by , we get  Or  Integrating, we get the solution | | | | | | | |
| 50 | **(c)**  We have  So I.F.  General solution is given by  As so  But (Rejected)  Hence | | | | | | | |
| 51 | **(a)**  (1)  Again differentiating w.r.t. , we get  [using (1)] | | | | | | | |
| 52 | **(d)** | | | | | | | |
| 53 | **(c)**  The given differential equation can be written as which is linear differential equation of first order  where  the solution is,  When | | | | | | | |
| 54 | **(b)**  The given equation is reduced to | | | | | | | |
| 55 | **(a)**  We have  [using Leibnitz’s Rule] | | | | | | | |
| 56 | **(a)**  Hence, the equation of the curve is | | | | | | | |
| 57 | **(c)**  Given,        Centre (,0), radius=1 | | | | | | | |
| 58 | **(c)**  Integrating, we have  Or | | | | | | | |
| 59 | **(d)**  Put | | | | | | | |
| 60 | **(d)**  Which is of the form  Its integrating factor is  Here | | | | | | | |
| 61 | **(a)** | | | | | | | |
| 62 | **(b)**  solution is  Given | | | | | | | |
| 63 | **(b)**  It is given that the triangle is an isosceles triangle    Therefore, sub-normal  On integration, we get which is a rectangular hyperbola | | | | | | | |
| 64 | **(b)**  Replacing by | | | | | | | |
| 65 | **(a)**  (1)  Put  equation (1) transforms to  It passes through (2, 1) | | | | | | | |
| 66 | **(c)**  Slope of tangent  slope of normal  the equation of normal is;  This meets -axis , where  Integrating, we get  *,* which is a hyperbola | | | | | | | |
| 67 | **(c)**  The intersection of and is . Put  The given equation reduces to  Putting , we get  constant  constant | | | | | | | |
| 68 | **(a)**  If is the curve,  is the equation of the tangent at  Putting , the initial ordinate of the tangent is therefore  The subnormal at this point is given by so we have  This is a homogeneous equation and, by rewriting it as we see that it is also a linear equation | | | | | | | |
| 69 | **(b)**  Given,  Put                  Again, when | | | | | | | |
| 70 | **(a)**  Putting , we get  The equation is | | | | | | | |
| 71 | **(a)**  Integrating, we get  when where is constant  or  Now put | | | | | | | |
| 72 | **(c)**  We have,  Putting so that we get  On integration, we get  This passes through , therefore  So, | | | | | | | |
| 73 | **(b)**  The general equation of all non-horizontal lines in -plane is , where  Now,  [Diff. w.r.t.]  [Diff. w.r.t. ]  Hence, the required differential equation is | | | | | | | |
| 74 | **(b)**  We have,  This passes through  Therefore,  Thus the equation of the curve is | | | | | | | |
| 75 | **(c)**  (1)  (2)  Put value of in equation (1) | | | | | | | |
| 76 | **(a)**  Integrating, we get | | | | | | | |
| 77 | **(b)**  Putting , we get . The given equation can be written as | | | | | | | |
| 78 | **(c)**  (1)  (2)  (3)  Eliminating A between equations (2) and (3), we get | | | | | | | |
| 79 | **(c)**  satisfies  Then  hence | | | | | | | |
| 80 | **(a)**  If be the centre on -axis then its radius will be as it passes through origin. Hence its equation is  Or (1)  Or | | | | | | | |
| 81 | **(c)**  The given family of curve is (1)  Differentiating . , we get  [Using equation (1)] | | | | | | | |
| 82 | **(a)**  Given, and      Required solution is        Since, | | | | | | | |
| 83 | **(a)** | | | | | | | |
| 84 | **(a)**  Tangent at point is where  Let    According to questions,  (homogeneous)  Putting , we get  Also it passes through then | | | | | | | |
| 85 | **(b)**  which is linear  solution is | | | | | | | |
| 86 | **(a)**  Putting , the least equation can be written as  I.F.  solution is | | | | | | | |
| 87 | **(a)**  Multiplying by we get  Integrating, we get | | | | | | | |
| 88 | **(a)**  (1)  But  (2)  Hence, | | | | | | | |
| 89 | **(c)**  According to the question  min | | | | | | | |
| 90 | **(a)**  The given equation can be written as  On integrating, we get  Or | | | | | | | |
| 91 | **(c)**  Equation to the family of parabolas is  …(1)  (substituting from equation (1))  Hence the order is 2 and the degree is 1 | | | | | | | |
| 92 | **(a)**  Let the equation of the curve be    It is given that  [ Length of the subtangent]  It is linear differential equation  Its solution is | | | | | | | |
| 93 | **(a)**  The equation of a member of the family of parabolas having axis parallel to -axis is  (1)  Where and are arbitrary constants  Differentiating equation (1) ., we get (2)  Which on again differentiating gives (3)  Differentiating (3) . , we get | | | | | | | |
| 94 | **(a)**  Hence, the solution is  where | | | | | | | |
| 95 | **(a,b,c)**  a.  homogeneous of degree  b.  homogeneous  c.  homogeneous  d.  non homogeneous | | | | | | | |
| 96 | **(a,b)**  Let be any point on the curve. Length of intercept on -axis by any tangent at      Area of trapezium  Given, area of trapezium  or  Which is linear differential equation  An IF  The solution is | | | | | | | |
| 97 | **(c)**  By verification we find that the choice (c), i.e., satisfies the given differential equation  Alternate  (1)  Let  Then equation (1) changes to  or  or  For  or | | | | | | | |
| 98 | **(a,b)**  Comparing with | | | | | | | |
| 99 | **(a,c)**  Differentiating , we get  Eliminating , we get  or  It involves only first order derivative, its order is 1 but its degree is 3 as is there | | | | | | | |
| 100 | **(a,d)**  The given differential equation is  Integrating both sides, we get  (1)  It is given that at  Putting in equation (1), we get  Substituting the value of in (1), we obtain  (2)  Integrating both sides to, we get  This passes through the point (0,1). Therefore,  Hence, the required equation of the curve is  Obviously it is strictly increasing from equation (2)  Also , then the only root is negative | | | | | | | |
| 101 | **(a,b)**  which gives straight line  Or which gives circle | | | | | | | |
| 102 | **(c,d)**  The equation of tangent at is  Points are respectively and  Now,  or  or  or | | | | | | | |
| 103 | **(a,b)**  We have length of the normal=radius vector  or  or  Clearly, represents a rectangular hyperbola and represents circles | | | | | | | |
| 104 | **(a,c)**  We have,  or  Clearly, for  and for  It represents a parabola and represents a parabola.) | | | | | | | |
| 105 | **(a)**  Slope of the normal at (1,1)  Slope of tangent at  Since is proportional to ,  where  It passes through (1,1) | | | | | | | |
| 106 | **(b)** | | | | | | | |
| 107 | **(a,c)**  We have (1)  Differentiating , we get  (2)  Differentiating , we get  (3)  From equation (3), , where ,  Putting the value of in equation (2), we get  Substituting the values of and in equation (1),  We get  Which is the required differential equation | | | | | | | |
| 108 | **(a,b,c)**  We have . On integration, we get  (1)  Putting , we get  Integrating , we get (2)  Putting , we get  Putting , we get  Also  has no solution | | | | | | | |
| 110 | **(a,b)** | | | | | | | |
| 111 | **(a,c)**  For this to represent a parabola, one of the two terms or is zero  Therefore, either or | | | | | | | |
| 112 | **(a,d)**  Taking and , so that and ,  We have  and  The given equation can be transformed into  Integrating both sides, then we get  …..(i)  +constant}  Also, from Eq. (i), | | | | | | | |
| 113 | **(a,d)**  The D.E. can be re-written as  Since , and  we have  Put in the L.H.S and get  Integrating both sides, we get | | | | | | | |
| 114 | **(a,b,d)**  (linear)  solution is  When then  . Hence options (a), (b),(d) are true | | | | | | | |
| 115 | **(a,c)**  Obviously (a) is linear D.E. with and  Hence not linear  which is linear with and | | | | | | | |
| 116 | **(b)**  We have (constant)  where | | | | | | | |
| 117 | **(c)**  [Taking ]  Thus, there are actually three arbitrary constants and hence this differential equation should be of order 3 | | | | | | | |
| 118 | **(a,b,c,d)**  ….(i)  On solving, we get  Also from Eq. (i), | | | | | | | |
| 119 | **(d)**  Given,  IF  Solution is  On putting respectively, we get | | | | | | | |
| 120 | **(d)**  Statement 2 is obviously true. But statement 1 is false as  which has degree 1 | | | | | | | |
| 121 | **(a)**  The equation of circle contains. There independent constants if it passes through three non-collinear points, therefore statement 1 is true and follows from statement 2 | | | | | | | |
| 122 | **(d)**  (say)  Order is 1. | | | | | | | |
| 123 | **(a)**  Let constant  Then, | | | | | | | |
| 124 | **(c)**  Given,  At  Now, | | | | | | | |
| 125 | **(a)**  On differentiating, we get | | | | | | | |
| 126 | **(d)**  Then, the given equation reduces to  =0  Which is variable seperable form. | | | | | | | |
| 127 | **(a)**  Let  Here, in this equation, there are three constants.  Order = 3  Circle passes through three non-collinear points, then we get three constants . | | | | | | | |
| 128 | **(b)**  From Statement II  Differential equation can be written as  or  or  will satisfy the above equation.  From Statement I  It is passes through (3, 9). | | | | | | | |
| 129 | **(d)**  The given equation cannot be written as a polynomial in all the differentials.  Degree of the equation is not defined. | | | | | | | |
| 130 | **(a)**  Total number of independent parameters in the given general solution is 3  Hence statement 1 is true, also statement 2 is true which explains statement 1 | | | | | | | |
| 131 | **(b)**  Statement 1 is obviously true  Even statement 2 is also obviously true but it does not explain statement 1 | | | | | | | |
| 132 | **(b)**  ….(i)  [from Eq. (i)] | | | | | | | |
| 133 | **(a)**  Equation of the required parabola is of the form. Differentiating, we have  The degree of this differential equation is 1 and the order is 2  b. we have (1)  (2)  Dividing equations (1) by (2), we get  , where  Substituting in equation (1)  We get  Clearly, it is a differential equation of degree 3  c. The given equation is  Cubing, we get  Hence order  d. We have (1)  Diff. , we get  Putting in equation (1), we get  Its order is 1 and degree is 3 | | | | | | | |
| 134 | **(b)**  a.  Now,  and  b. Since equation is 2 degree, two linew are possible  c.  Substituting the value of and in  We have  For homogeneous  and  d.  Putting these values in  We have  or  or | | | | | | | |
| 135 | **(b)**  ...(i)  Initially, and , then  From Eq. (i), | | | | | | | |
| 137 | **(b)**  and  is an increasing function  (as and is positive)  Also  is a decreasing function  g(0)  Thus has one solution | | | | | | | |
| 138 | **(c)**  Given equation can be rewritten as  (1)  Differentiating , we get  gives the general solution and  As singular solution | | | | | | | |
| 139 | **(c)**  Integrating we get  When so that . Hence  (1)  Integrating, we get  When , so that  Thus, we have  From equation (1), we get the critical points ,  At the critical point is ve  Therefore, at , has a local maximum  At is ve  Therefore, at has a local minimum  Also  Hence the global maximum value  And the global minimum value | | | | | | | |
| 140 | **(a)**  Let denote the amount of material present at time . Then,  This differential equation is separable and linear, its solution is (1)  At , we are given that . Therefore, from equation (1), , or  Thus, (2)  At ,10 percent of the original mass of or, has decayed  Hence, at  Substituting these values into equation (2) and solving for , we have or  Substituting this value into (2), we obtain the amount of mass present at any time as  (3)  Where is measured in hours | | | | | | | |
| 141 | **(a)**  Here, , and . Hence  The solution of this linear equation is (1)  At , we are given that  Substituting these values into equation (1), we find that , so that equation (1) can be rewritten as  For | | | | | | | |
| 142 | **(2)**  Equation of tangent is perpendicular distance from origin is    from (0,0)  (1) (Homogeneous)  Put in (1)  Passes through (1,1), then  For intercept of curve on x-axis, put  We have or  Hence length of intercept is 2 | | | | | | | |
| 143 | **(2)**  Given  Now general solution is given by  As  Hence | | | | | | | |
| 144 | **(3)**  Let  Curve passes through the point (1,1) then the value of  Hence the curve is | | | | | | | |
| 145 | **(2)**  The solution is | | | | | | | |
| 146 | **(8)**  Equation of tangent at of  (1)  This tangent cuts the -axis so  are in AP  given  Integrating both sides  passes through (0,2) | | | | | | | |
| 147 | **(4)**  So  finite value so | | | | | | | |
| 148 | **(4)**  We have (1)  Put , in equation (1), we get  Therefore, (0,0) lies on the curve  Now on differentiating equation (1) , we get | | | | | | | |
| 149 | **(8)**  I.F.  Solution is | | | | | | | |
| 150 | **(5)**    Put  Hence curve is parabola, which has eccentricity 1 | | | | | | | |
| 151 | **(1)**  Hence  Becomes  Or ; | | | | | | | |
| 152 | **(2)**  Given  (1)  Now [using product rule]  (2)  Now  (3)  From (2) and (3), we have RHS of (2) RHS of (3) | | | | | | | |