Multiple Choice Questions MHT-CET

[MHT-CET 2022] (online shift)

1. The order and degree of the differential equation $\left(1+\frac{dy}{dx}\right)^{\frac{1}{3}} = \sqrt{\frac{d^2y}{dx^2}}$ respectively,
   a) 3, 2 b) 2, 1 c) 3, 1 d) 2, 3

2. The general solution of differential equation $xdy - ydx = 0$ represents
   a) The circle whose centre is at origin
   b) A straight line passing through the origin
   c) A rectangular hyperbola
   d) The parabola whose vertex is at the origin

3. The rate of disintegration of a radioactive element at time t is proportional to its mass at that time. Then the time during which the original mass of 6 gm will disintegrate into its mass of 3 gm is proportional to
   a) log 5 b) log 4 c) log 2 d) log 3

4. The general solution of the differential equation $x^2 + y^2 - 2xy\frac{dy}{dx} = 0$ (where c is constant of integration)
   a) $2(x^2 - y^2) + x = c$ b) $x^2 - y^2 = cx$ c) $x^2 + y^2 = cx$ d) $x^2 + y^2 = cy$

5. The particular solution of the differential equation $\frac{dy}{dx} - e^x = ye^x$, when $x = 0$ and $y = 1$ is
   a) $\log\left(\frac{y+1}{2}\right) = e^x - 1$ b) $\log 2(y-1) = e^x - 1$
   c) $\log(y-1) = e^x - 1$ d) $\left(\frac{y+1}{2}\right) = \frac{e^x}{2} - \frac{1}{2}$

6. Water at 100°C cools in 10 minutes to 80°C at a room temp. of 25°C, then the temp. of water after 20 minutes will be
   a) 65.33°C b) 69.33°C c) 60.33°C d) 63.33°C

7. The differential equation $2x\frac{dy}{dx} - y = 1$ represents a family of
   a) straight lines b) hyperbolas c) parabolas d) circles

8. If $(x^2 + y^2)\,dy = xy\,dx$ with $y(x_0) = e$, $y(1) = 1$, then x_0 has the value
   a) $\sqrt{3}\,e$ b) $\sqrt{3}\,e^2$ c) e d) $\sqrt{3e}$

9. The solution of the differential equation $(1 + x)\,y\,dx + (1 - y)\,x\,dy = 0$ is
   a) $\log xy - x - y = c$ b) $\log xy - x + y = c$
   c) $\log(xy) + x - y = c$ d) $\log\left(\frac{x}{y}\right) - x + y = c$

10. General solution of the differential equation $x \cos y \, dy = (xe^x \log x + e^x) \, dx$ is
a) $\sin y = e^x \log x + c$ b) $\sin y = e^x + c \log x$
c) $\sin y = c e^x + \log x$ d) $e^x \sin y = \log x + c$

[MHT-CET 2021] (online shift)

11. The general solution of the differential equation $\frac{dy}{dx} = \frac{x+y+1}{x+y-1}$ is given by
a) $y = x \log (x + y) + c$ b) $x - y = \log (x + y) + c$
c) $x + y = \log (x + y) + c$ d) $y = x + \log (x + y) + c$

12. If m is order and n is degree of the differential equation $y = \frac{dp}{dx} + \sqrt{a^2p^2 - b^2}$, where $p = \frac{dy}{dx}$, then the value of $m + n$ is
a) 2 b) 3 c) 4 d) 5

13. The general solution of the differential equation $\cos x \cdot \sin y \, dx + \sin x \cdot \cos y \, dy = 0$ is
a) $\sin x + \sin y = c$ b) $\cos x + \cos y = c$ c) $\sin x \cdot \sin y = c$ d) $\cos x \cdot \cos y = c$

14. The differential equation of an ellipse whose major axis is twice its minor axis, is
a) $x + 4y \cdot \frac{dy}{dx} = 0$ b) $x - 4y \frac{dy}{dx} = 0$ c) $x + 2y \frac{dy}{dx} = 0$ d) none of these

15. The population of a city increases at a rate proportional to the population at that time. If the population of the city increases from 20 lakhs to 40 lakhs in 30 yrs then after another 15 years the population is
a) $10\sqrt{2}$ lakhs b) $40\sqrt{2}$ lakhs c) $30\sqrt{2}$ lakhs d) none of these

16. The particular solution of the differential equation $y (1 + \log x) = (\log x^x) \frac{dy}{dx}$, when $y(e) = e^2$ is
a) $2ex \log x - y = e^2$ b) $3ex \log y \, x - y = 2e^2$
c) $ex \log x + y = 2e^2$ d) $ex \log x - y = 0$

17. The particular solution of the differential equation $\frac{dy}{dx} = \frac{y+1}{x^2 - x}$ when $x = 2$ and $y = 1$ is
a) $xy = 4x - 6$ b) $xy = 2x - 2$ c) $xy = x - 2$ d) $xy = -x + 4$

18. If the surrounding air is kept at 25°C and a body cools from 80°C to 50°C in 30 min. Then the temp. of the body after one hour will be
a) 31.72°C approx b) 34.74°C approx c) 32.36°C approx d) 36.36°C approx

19. The order of the differential equation whose solution is $y = a \cos x + b \sin x + c e^{-x}$ is
a) 3 b) 4 c) 2 d) 1

20. The differential equation of all parabolas whose axis is y – axis is
a) $\frac{d^2y}{dx^2} - \frac{dy}{dx} = 0$ b) $\frac{xd^2y}{dx^2} + \frac{dy}{dx} = 0$ c) $\frac{xd^2y}{dx^2} - \frac{dy}{dx} = 0$ d) $\frac{d^2y}{dx^2} - y = 0$

[MHT-CET 2019]

31. The general solution of $x\frac{dy}{dx} = y - x\tan\left(\frac{y}{x}\right)$ is

a) $x\sin\left(\frac{y}{x}\right) = c$ b) $x\sin\left(\frac{x}{y}\right) = c$ c) $x^2\sin\left(\frac{x}{y}\right) = c$ d) $x^2\sin\left(\frac{y}{x}\right) = c$

32. The order of differential equation of all circles whose radius is 4 is

a) 4 b) 3 c) 2 d) 1

33. The general solution of the differential equation of all circles having centre at A (–1, 2) is

a) $x^2 + y^2 - x + 2y + c = 0$ b) $x^2 + y^2 + x - 2y + c = 0$

c) $x^2 + y^2 - 2x + 4y + c = 0$ d) $x^2 + y^2 + 2x - 4y + c = 0$

34. The solution of the differential equation $ydx - xdy = xy\,dx$ is

a) $x^2 = e^x y^2 c$ b) $x = ye^x c$ c) $xy = e^x c$ d) $x^2y^2 = \log x\, c$

35. The particular solution of the diff. equation $\log\left(\frac{dy}{dx}\right) = x$, when $x = 0, y = 1$ is

a) $y = -e^x + 2$ b) $y = e^x + 2$ c) $y = e^x$ d) $y = -e^x$

36. The order of the differential equation of all circles which lie in the first quadrant and touch both the axes is

a) 4 b) 1 c) 3 d) 2

37. The solution of the differential equation $(x^2+1)\frac{dy}{dx} + (y^2+1) = 0$ is

a) $x^2 = y^2 + c$ b) $x + y = c$

c) $\tan^{-1}x + \tan^{-1}y = c$ d) $(x^2+1)(y^2+1) = c$

38. The integrating factor of the differential equation $(1 + y^2)\,dx + (x - e^{-\tan y})\,dy = 0$

a) $e^{\tan^{-1}y}$ b) $ye^{\tan^{-1}y}$ c) $-ye^{\tan^{-1}y}$ d) $xe^{\tan^{-1}y}$

39. The solution of the differential equation $\frac{dx}{dy} + \frac{1+x}{1-y} = 0$ is

a) $(x-1)(y+1) = c$ b) $\frac{1+x}{1-y} = c$

c) $(1+x)(1-y) = c$ d) $\frac{1+x}{1+y} = c$

40. The differential equation of all lines having slope m, passing through origin is

a) $\frac{dy}{dx} = m$ b) $\frac{d^2y}{dx^2} = 0$ c) $x\frac{dy}{dx} = y$ d) $y = \frac{dy}{dx} + c$

[MHT-CET 2018]

41. The general solution of differential equation $\frac{dx}{dy} = \cos(x + y)$ is

a) $\tan\left(\frac{x+y}{2}\right) = y + c$ b) $\tan\left(\frac{x+y}{2}\right) = x + c$

c) $\cot\left(\frac{x+y}{2}\right) = y + c$ d) $\cot\left(\frac{x+y}{2}\right) = x + c$

42. The order of the differential equation of all parabolas, whose latus rectum is $4a$ and axis parallel to the x – axis is

a) 1 b) 4 c) 3 d) 2

[MHT-CET 2017]

43. The solution of the differential equation $\frac{dy}{dx} = \tan\left(\frac{y}{x}\right) + \frac{y}{x}$ is

a) $\cos\left(\frac{y}{x}\right) = cx$ b) $\sin\left(\frac{y}{x}\right) = cx$ c) $\frac{-x}{y}$ d) $\sin\left(\frac{y}{x}\right) = cy$

44. The differential equation of all parabolas whose axis is y – axis is

a) $x \cdot \frac{d^2y}{dx^2} - \frac{dy}{dx} = 0$ b) $x \cdot \frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$ c) $\frac{d^2y}{dx^2} - y = 0$ d) $\frac{d^2y}{dx^2} - \frac{dy}{dx} = 0$

45. The particular solution of the differential equation $x\,dy + 2y\,dx = 0$ when $x = 2$ and $y = 1$ is

a) $xy = 4$ b) $x^2y = 4$ c) $xy^2 = 4$ d) $x^2y^2 = 4$

[MHT-CET 2016]

46. The degree and order of the differential equation $\left[1 + \left(\frac{dy}{dx}\right)^3\right]^{7/3} = 7\left(\frac{d^2y}{dx^2}\right)$ resp. are

a) 3 and 7 b) 3 and 2 c) 7 and 3 d) 2 and 3

47. The particular solution of the differential equation $y(1 + \log x)\frac{dx}{dy} - x \log x = 0$, when $x = e, y = e^2$ is

a) $y = e\,x \log x$ b) $ey = x \log x$ c) $xy = e \log x$ d) $y \log x = ex$

48. If $\sin x$ is integrating factor of linear differential equation $\frac{dy}{dx} + Py = Q$, then P is

a) $\log \sin x$ b) $\cos x$ c) $\tan x$ d) $\cot x$

[MHT-CET 2015] (JEE – 15)

49. The solution of the differential equation $y\,dx - (x + 2y^2)\,dy = 0$ is $x = f(y)$. If $f(-1) = 1$, then $f(1)$ is equal to

a) 4 b) 3 c) 1 d) 2

154. The sum of the order and degree of the differential equation $\sqrt{\frac{d^2y}{dx^2}} = \sqrt[5]{\frac{dy}{dx} - 5}$ is

a) 1 b) 3 c) 5 d) 7

155. The differential equation whose solution is $Ax^2 + By^2 = 1$, where A and B are arbitrary constants is of

a) degree 1 and order 2 b) degree 2 and order 1
c) degree 3 and order 2 d) degree 1 and order 3

156. The order and degree of differential equation of all tangent lines to the parabolas $x^2 = 4y$ is respectively

a) 1, 2 b) 2, 2 c) 3, 1 d) 4, 1

157. The differential equation of all straight lines passing through the point $(1, -1)$ is

a) $y = (x+1)\frac{dy}{dx} + 1$ b) $y = (x+1)\frac{dy}{dx} - 1$ c) $y = (x-1)\frac{dy}{dx} + 1$ d) $y = (x-1)\frac{dy}{dx} - 1$

158. The differential equation of all parabolas having vertex at the origin and axis along the positive y-axis is

a) $x\frac{dy}{dx} + y = 0$ b) $x\frac{dy}{dx} - y = 0$ c) $x\frac{dy}{dx} + 2y = 0$ d) $x\frac{dy}{dx} - 2y = 0$

159. The differential equation satisfied by $y = X \sin(6t + 5) + Y \cos(6t + 5)$, where X and Y are constants, is

a) $\frac{d^2y}{dx^2} + 6y = 0$ b) $\frac{d^2y}{dx^2} = 0$ c) $\frac{d^2y}{dx^2} + 36y = 0$ d) $\frac{d^2y}{dx^2} + 25y = 0$

160. The differential equation which represents the family of curves $y = A\,e^{Bx}$, where A and B are constants, is

a) $y'' = yy'$ b) $yy'' = y'$ c) $yy'' = (y')^2$ d) $y' = y^2$

161. The differential equation for $y = e^x (a \cos x + b \sin x)$ is

a) $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 2y = 0$ b) $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - 2y = 0$

c) $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0$ d) $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - 2y = 0$

162. If the differential equation $\frac{dy}{dx} + \frac{x}{y} = \frac{a}{y}$, where a is constant, represents a family of circles, then the radius of the circle is (c is the constant of integration)

a) $a + 2c$ b) $a^2 + 2c$ c) $\sqrt{a^2 + 2c}$ d) $\sqrt{a + c}$

163. The equation of the curve passing through (1, 0) and having the slope of tangent at any point (x, y) of the curve as $\frac{y-1}{x^2 + x}$ is

a) $2(y - 1) + x(x + 1) = 0$ b) $2x - (y - 1)(x + 1) = 0$
c) $2x + (y - 1)(x + 1) = 0$ d) $2x(y - 1) + x + 1 = 0$