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REDUCED Differential Equations

12th Standard

Business Maths

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36 x 1 = 36

1) The degree of the differential equation $\frac{d^4y}{dx^4} - \left(\frac{d^2y}{dx^2}\right)^4 + \frac{dy}{dx} = 3$

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

2) The order and degree of the differential equation $\sqrt{\frac{d^2y}{dx^2}} = \sqrt{\frac{dy}{dx} + 5}$ are respectively

(a) 2 and 3 (b) 3 and 2 (c) 2 and 1 (d) 2 and 2

3) The order and degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^{\frac{3}{2}} - \sqrt{\left(\frac{dy}{dx}\right)} - 4 = 0$ are respectively

(a) 2 and 6 (b) 3 and 6 (c) 1 and 4 (d) 2 and 4

4) The differential equation $\left(\frac{dx}{dy}\right)^3 + 2y^{\frac{1}{2}}$ = x is

(a) of order 2 and degree 1 (b) of order 1 and degree 3 (c) of order 1 and degree 6 (d) of order 1 and degree 2

5) The differential equation formed by eliminating a and b from $y = ae^x + be^{-x}$ is

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

6) The integrating factor of the differential equation $\frac{dx}{dy} + Px = Q$

(a) $e^{\int Pdx}$ (b) $\int Pdx$ (c) $\int Pdy$ (d) $e^{\int Pdy}$

7) If y=cx + c− c^3 then its differential equation is

(a) $y = \frac{dy}{dx} + \frac{dy}{dx} - \left(\frac{dy}{dx}\right)^3$ (b) $y = \left(\frac{dy}{dx}\right)^3 = x\frac{dy}{dx} - \frac{dy}{dx}$ (c) $\frac{dy}{dx} + y = \left(\frac{dy}{dx}\right)^3 - x\frac{dy}{dx}$

8) The differential equation of y = mx + c is (m and c are arbitrary constants)

(a) $\frac{d^2y}{dx^2}$ = 0 (b) y = x $\frac{dy}{dx}$ + c (c) xdy + ydx = 0 (d) ydx − xdy = 0

9) The particular integral of the differential equation is $\frac{d^2y}{dx^2} - 8\frac{dy}{dx}$ +16y = $2e^{4x}$

(a) $\frac{x^2e^{4x}}{2!}$ (b) $\frac{e^{4x}}{2!}$ (c) x^2e^{4x} (d) xe^{4x}

10) Solution of $\frac{dy}{dx}$ + Px = 0

(a) $x=ce^{py}$ (b) $x=ce^{-py}$ (c) x = py + c (d) x = cy

11) The differential equation of $x^2 + y^2 = a^2$

(a) xdy + ydx = 0 (b) ydx – xdy = 0 (c) xdx – ydx = 0 (d) xdx + ydy = 0

12) The general solution of the differential equation $\frac{dy}{dx}$ = cos x is

(a) y = sinx + 1 (b) y = sinx - 2 (c) y = cos x + c, c is an arbitrary constant (d) y = sin x + c, c is an arbitrary constant

13) A homogeneous differential equation of the form $\frac{dy}{dx}$ = $f\left(\frac{y}{x}\right)$ can be solved by making substitution,

(a) y = v x (b) v = y x (c) x = v y (d) x = v

14) A homogeneous differential equation of the form $\frac{dx}{dy}$ = $f\left(\frac{y}{x}\right)$ can be solved by making substitution,

(a) x = v y (b) y = v x (c) y = v (d) x = v

15) The variable separable form of $\frac{dy}{dx} = \frac{y(x-y)}{x(x+y)}$ by taking y = vx and $\frac{dy}{dx} = v + x\frac{dv}{dx}$ is

(a) (b) (c) (d)

$\frac{2v^2}{1+v}dv = \frac{dx}{x}$ $\frac{2v^2}{1+v}dv = -\frac{dx}{x}$ $\frac{2v^2}{1-v}dv = \frac{dx}{x}$ $\frac{1+v}{2v^2}dv = -\frac{dx}{x}$

16) Which of the following is the homogeneous differential equation?
(a) (3x−5)dx = (4y−1)dy (b) xy dx− (x³+y³)dy = 0 (c) y²dx+(x² − xy − y²)dy = 0 (d) (x²+y)dx = (y²+x)dy

17) The differential equation $\left(\frac{dx}{dy}\right)^2 + 5y^{\frac{1}{3}}$ =x is
(a) order 2 degree 2 (b) order 1 degree 6 (c) order 1 degree 3 (d) order 1 degree

18) The differential equation of all circles with centre at the origin is
(a) xdy +ydx = 0 (b) xdy - ydx = 0 (c) xdx + ydy = 0 (d) xdx - ydy = 0

19) The amount present in a radio active element disintegrates at a rate proportional to its amount. The differential equation corresponding to the above statement is (k is negative).
(a) $\frac{dp}{dt} = \frac{k}{p}$ (b) $\frac{dp}{dt}$ =kt (c) $\frac{dp}{dt}$ =kp (d) $\frac{dp}{dt}$ =-kt

20) The differential equation satisfied by all the straight lines in xy plane is
(a) $\frac{dy}{dx}$ =a constant (b) $\frac{d^2y}{dx^2}$ =0 (c) y+ $\frac{dy}{dx}$ = 0 (d) $\frac{d^2y}{dx^2}$ +y=0

21) If y = k.e$^{\lambda x}$ then its differential equation where k is arbitrary constant is
(a) $\frac{dy}{dx}$ =λy (b) $\frac{dy}{dx}$ =ky (c) $\frac{dy}{dx}$ +ky=0 (d) $\frac{dy}{dx}$ =eλx

22) The differential equation obtained by eliminating a and b from y = a e^{3x} + b e^{-3x} is
(a) $\frac{d^2y}{dx^2}$ +ay=0 (b) $\frac{d^2y}{dx^2}$ -9y=0 (c) $\frac{d^2y}{dx^2} - 9\frac{dy}{dx}$ (d) $\frac{d^2y}{dx^2}$ +9x=0

23) The differential equation formed by eliminating A and B from y = e^x (A cos x + B sin x) is
(a) $y_2+y_1=0$ (b) $y_2-y_1=0$ (c) $y_2-2y_1+2y=0$ (d) $y_2-2y_1-2y=0$

24) The degree of the differential equation $\sqrt{1+\left(\frac{dy}{dx}\right)^{\frac{1}{3}}} = \frac{d^2y}{dx^2}$ is
(a) 1 (b) 2 (c) 3 (d) 6

25) The degree of c = $\frac{\left[1+\left(\frac{dy}{dx}\right)^3\right]^{2/3}}{\frac{d^3y}{dx^3}}$ where c is a constant is
(a) 1 (b) 3 (c) -2 (d) 2

26) The degree and order of $\frac{d^2y}{dx^2} - 6\sqrt{\frac{dy}{dx}}$ =0 are
(a) 2,1 (b) 1,2 (c) 2,2 (d) 1,1

27) The solution of xdx +ydy = 0 is
(a) $x^2+y^2=c$ (b) $\frac{x}{y}$ =c (c) $x^2-y^2=c$ (d) xy=c

28) The solution of $\frac{dy}{dx}$ =e^{x-y} is
(a) $e^y e^x = c$ (b) y=log ce^x (c) y=log(e^x+c) (d) e^{x+y} = c

29) The solution of $\frac{dp}{dt}$ =ke^{-t} (k is a constant) is
(a) c-$\frac{k}{e^t}$ =p (b) p=ke^t+c (c) t=log$\left(\frac{c-p}{k}\right)$ (d) t=log$_c$p

30) In $(x^2-y^2)dy=2xy\,dx$, if we put y=vx, then the equation is transformed into
(a) $\frac{1+v^2}{v+v^3}dv = \frac{dx}{x}$ (b) $\frac{1-v^2}{v(1+v^2)}dv = \frac{dx}{x}$ (c) $\frac{dv}{v^2-1} = \frac{dx}{x}$ (d) $\frac{dv}{1+v^2} = \frac{dx}{x}$

31) Solution of $\frac{dx}{dy}$ +mx=0 where m< 0 is _____
(a) x=ce^{my} (b) x=ce^{-my} (c) x=my+c (d) x=c

32) y=cx-c² is the general solution of _____
(a) $(y^1)2-xy^1+y=0$ (b) $y^{11}=0$ (c) $y^1=0$ (d) $(y^1)^2+xy^1+y=0$

33) The differential equation of the family of lines y=mx is _____
(a) $\frac{dy}{dx}$ =m (b) y dx - x dx (c) $\frac{d^2y}{dx^2}$ =0 (d) y dx + x dy=0

34) If $\frac{dy}{dx} = \frac{x-y}{x+y}$, then the solution is _____
(a) $2xy+y^2+x^2=c$ (b) $x^2+y^2-x+y=c$ (c) $x^2+y^2-2xy=c$ (d) $x^2-y^2-2xy=c$

35) On putting y = vx; homogeneous differential equation $x^2dy+y(x+y)dx=0$ becomes _____
(a) x dv + (b) v dx + (c) v^2 dx- (d) v dv +

(2v+v^2)dx=0 (2x+x^2)dv=0 (x+x^2)dv=0 (2x+x^2)dx=0

36) The equation of ydx+xdy=e^{-xy} dx if it cuts the Y-axis is _____
(a) e^{xy} (b) e^{xy}=c (c) e^{xy}=x+1 (d) e^{xy}=y+1

30 x 2 = 60

37) Find the order and degree of the following differential equations

$\frac{d^2y}{dx^2} + 3\left(\frac{dy}{dx}\right)^2 + 4y = 0$

38) Solve: (x^2+x+1)dx+(y^2−y+3)dy = 0

39) Solve: $\frac{dy}{dx} = ae^y$

40) Solve: ydx − xdy = 0

41) Solve: $\frac{dy}{dx}$ = y sin 2x

42) Find the curve whose gradient at any point P(x, y) on it is $\frac{x-a}{y-b}$ and which passes through the origin.

43) Find the order and degree of the following differential equations.

$\frac{d^2y}{dx^2} = \sqrt{y - \frac{dy}{dx}} = 0$

44) Find the order and degree of the following differential equations.

$\frac{d^3y}{dx^3} = 0$

45) Find the order and degree of the following differential equations.

$\frac{d^2y}{dx^2} + y + \left(\frac{dy}{dx} - \frac{d^3y}{dx^3}\right)^{3/2} = 0$

46) Find the order and degree of the following differential equations.

(2 - y'')^2 = y''^{2} + 2y'

47) Find the order and degree of the following differential equations.

$\left(\frac{dy}{dx}\right)^3 + y = x - \frac{dx}{dy}$

48) Find the differential equation of the following

xy = c^2

49) Find the differential equation of the following

x^2 + y^2 = a^2

50) Solve: $\frac{1+x^2}{1+y} = xy\frac{dy}{dx}$

51) Solve: $\frac{dy}{dx}$ + e^x+ye^x = 0

52) Solve: $\log\left(\frac{dy}{dx}\right)$ = ax + by

53) Write down the order and degree of the following differential equations.

$\left(\frac{dy}{dx}\right)^3 - 4\left(\frac{dy}{dx}\right)$ +y=3e^x

54) Write down the order and degree of the following differential equations.

$\left(\frac{dy}{dx}\right)^2 - 7\frac{d^3y}{dx^3} + y\frac{d^2y}{dx^2} + 4\frac{dy}{dx}$ -logx=0

55) Write down the order and degree of the following differential equations.

$\sqrt{1 + \left(\frac{dy}{dx}\right)^2}$ =4x

56) Write down the order and degree of the following differential equations.

$\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{2}{3}} = \frac{d^2y}{dx^2}$

57) Find the differential equation for y=mx+$\frac{a}{m}$ where m is arbitrary constant.

58) Form the differential equation of family of rectangular hyperbolas whose asymptotes are the Co-ordinate axes.

59) Solve: x dy +y dx = 0

60) Solve: (x^2 - ay)dx = (ax-y^2)dy

61) Find the order and degree of the following differential equation
$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 3y = 0$
62) Find the order and degree of the following differential equation
$\frac{d^2y}{dx^3} - 3\left(\frac{dy}{dx}\right)^6 + 2y = x^2$
63) Find the order and degree of the following differential equation
$\left[1 + \frac{d^2y}{dx^2}\right]^{\frac{3}{2}} = a\frac{d^2y}{dx^2}$
64) Find the order and degree of the following differential equation
y' +(y'')^2 =(x+y'')^2
65) Find the order and degree of the following differential equation
$\frac{d^3y}{dx^3} - \left(\frac{dy}{dx}\right)^{\frac{1}{2}} = 0$
66) Find the order and degree of the following differential equation
$y = 2\left(\frac{dy}{dx}\right)^2$ + 4x$\frac{dy}{dx}$

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67) Find the order and degree of the following differential equations.
$\frac{dy}{dx} + 2y = x^3$
68) Find the differential equation of the following
y = cx + c − c^3
69) Form the differential equation by eliminating α and β from (x − α)^2 + (y − β)^2 = r^2
70) Find the differential equation of the family of all straight lines passing through the origin.
71) Form the differential equation that represents all parabolas each of which has a latus rectum 4a and whose axes are parallel to the x axis.
72) Find the differential equation of all circles passing through the origin and having their centers on the y axis.
73) Find the differential equation of the family of parabola with foci at the origin and axis along the x-axis.
74) Find the differential equation of the family of curves y = e^x (acos x + bsin x) where a and b are arbitrary constants.
75) Find the differential equation of the family of curves $y = \frac{a}{x} + b$ where a and b are arbitrary constants
76) Find the differential equation corresponding to y=ae^{4x} + be^{-x} where a, b are arbitrary constants.
77) Solve $\frac{dy}{dx}$ = e^{x-y}+ x^{2}e^{-y}
78) Solve sec^{2}x tan y dx + sec^{2}y tan x dy = 0
79) Solve ydx − xdy − 3x^{2}y^{2}e^{x3}dx = 0
80) The marginal cost function of manufacturing x gloves is 6 +10x−6x^2. The total cost of producing a pair of gloves is Rs. 100. Find the total and average cost function.
81) Solve: y(1 - x) - x$\frac{dy}{dx}$ = 0
82) Solve: cosx(1 + cos y)dx − sin y(1 + sin x)dy = 0
83) Solve: (1 − x)dy − (1 + y)dx = 0
84) Solve $\frac{dy}{dx} = xy + x + y + 1$
85) Find the differential equation of all circles x^2 +y^2 + 2gx = 0 which pass through the origin and whose centres are on the X-axis.
86) Form the differential equation for $\frac{x^2}{a^2} + \frac{y^2}{b^2}$ =1 where a & b are arbitrary constants.
87) Form the differential equation for y=(A+Bx)e^{3x} where A and B are constants.
88) Solve: sec 2x dy - sin 5x sec^2 y dx = 0
89) Solve: cos^{2}x dy + y.e^{tanx} dx=0

90) Solve: $(x^2-yx^2)dy + (y^2+xy^2)dx=0$

22 x 5 = 110

91) Find the differential equation of the family of straight lines y=mx + c when
(i) m is the arbitrary constant
(ii) c is the arbitrary constant
(iii) m and c both are arbitrary constants.

92) Solve $3e^x \tan y dx + (1 + e^x)\sec^2 y dy = 0$ given $y(0) = \frac{\pi}{4}$

93) Solve : $x - y \frac{dx}{dy} = a\left(x^2 + \frac{dx}{dy}\right)$

94) The normal lines to a given curve at each point(x,y) on the curve pass through the point (1,0). The curve passes through the point (1,2). Formulate the differential equation representing the problem and hence find the equation of the curve.

95) The sum of Rs. 2,000 is compounded continuously, the nominal rate of interest being 5% per annum. In how many years will the amount be double the original principal? ($\log_e 2 = 0.6931$)

96) Solve the differential equation $y^2dx + (xy + x^2)dy = 0$

97) Solve the differential equation $\frac{dy}{dx} = \frac{x-y}{x+y}$

98) Find the particular solution of the differential equation $x^2 dy + y(x + y)dx = 0$ given that x=1, y=1

99) If the marginal cost of producing x shoes is given by$(3xy + y^2)dx + (x^2 + xy)dy = 0$ and the total cost of producing a pair of shoes is given by Rs. 12. Then find the total cost function.

100) The marginal revenue 'y' of output 'q' is given by the equation $\frac{dy}{dq} = \frac{q^2+3y^2}{2qy}$. Find the total Revenue function when output is 1 unit and Revenue is Rs. 5.

101) Solve the following homogeneous differential equations.
$x\frac{dy}{dx} = x + y$.

102) Solve the following homogeneous differential equations.
$(x - y)\frac{dy}{dx} = x + 3y$.

103) Solve the following homogeneous differential equations.
$x\frac{dy}{dx} - y = \sqrt{x^2 + y^2}$

104) Solve the following homogeneous differential equations.
$\frac{dy}{dx} = \frac{3x-2y}{2x-3y}$

105) Solve the following homogeneous differential equations.
$(y^2 - 2xy)dx = (x^2 - 2xy)dy$

106) The slope of the tangent to a curve at any point (x, y) on it is given by $(y^3-2yx^2)dx + (2xy^2-x^3)dy=0$ and the curve passes through (1, 2). Find the equation of the curve.

107) An electric manufacturing company makes small household switches. The company estimates the marginal revenue function for these switches to be $(x^2 + y^2)dy = xydx$ where x represents the number of units (in thousands). What is the total revenue function?

108) Solve $(x^2 + y^2)dx + 2xy\, dy = 0$

109) Solve $x^2ydx-(x^3+y^3)dy=0$

110) The net profit p and quantity x satisfy the differential equation $\frac{dp}{dx} = \frac{2p^3-x^3}{3xp^2}$. Find the relationship between the net profit and demand given that p = 20, when x = 10.

111) The rate of increase in the cost Cof ordering holding as the size q of the order increases is given by the differential equation $\frac{dc}{dq} = \frac{c^2+2cq}{q^2}$. Find the relationship between c and q if c = 1 when q = 1.

112) The total cost of production y and the level of output x are related to the marginal cost of production by the equation $(6x^2+2y^2)dx-(x^2+4xy)dy=0$. What is the relation between total cost and output if y = 2 when x = 1?

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