ENGLISH
Q.1. Read ‘The Invisible Man’ (the novel prescribed by the CBSE) and make a project highlighting the following: About the author, Plot, Character analysis-Griffin. Marvel & Dr Kemp, Critical appreciation.
Q.2. Read the newspaper every day. Cut out classified ads for (1) For sale (property, vehicle, household goods) (2) To LET (3) Lost and Found (4) Situation Vacant (single vacancy) (5) Matrimonial. Paste 4 of each kind on the pages in the English notebook. Also cut out five letter to editor and five articles published in the newspaper on current issues.
Q.3. Prepare an article & speech as per the directions given and mail at the following id’s: apkaur@vdjs.edu.in, rohitsharma@vdjs.edu.in, anitadhull@vdjs.edu.in. Kindly mail it by June 30, 2016
• XII-A : (1) There is no room for ‘terrorism’ in a humane society. How should we deal with this global problem? (ARTICLE) Roll no- 1 to 8
(2) India, the land of Buddha, Ashoka, Akbar and Gandhi is becoming an intolerant nation. Why so? (SPEECH) Roll no- 9 to 16

MATHEMATICS
CHAPTER – I : RELATIONS AND FUNCTIONS
1. Show that the relation R defined by (a, b) R (c, d) => a + d = b + c on the set N×N is an equivalence relation.
2. Prove that the relation R in the set A = {1, 2, 3, 4, 5} given by R = {(a, b) : |a – b| is even}, is an equivalence relation.
3. State whether the function f : N→ N given by f(x) = 5x is injective, surjective or both.
4. If f(x) = x + 7 and g(x) = x – 7, x ε R, find (fog)(7).
5. If f : R→ R and g : R→ R are defined respectively as f(x) = x² + 3x + 1 and g(x) = 2x – 3, find (a) fog, (b) gof.
6. If f : R→ R defined as f(x) = (2x – 7)/4 is an invertible function, find f⁻¹.
7. Is the binary operation *, defined on set N, given by a*b = (a + b)/2, for all a, b ε N, commutative? Is the given binary operation * associative?
8. Let * be a binary operation defined by a*b = 2a + b – 3. Find 3*4.
9. Let * be the binary operation on N given by a*b = LCM of a and b. Find the value of 20*16. Is * commutative? Is * associative?
10. Let * be a binary operation on set Q of rational numbers defined as a*b = ab/5. Write the identity for *, if any.
11. A = {x: x ε N, x < 6}
   a. R= { (a,b): |a-b| is even}. Find whether the relation R on A is equivalence.
   b. All the elements of {1,3,5} is not related to any element of {2,4} with respect to R.
      True/False. Justify your answer.
12. Let f: N→→ Y be a function defined by f(x) = x² + 1. Show that f is one – one and replace Y by a set so that f is invertible. Also find its inverse function.
13. If f : z → z and f(x) = x² + x, prove that the function is neither injective nor surjective.

CHAPTER – II : INVERSE TRIGONOMETRIC FUNCTIONS
1. Find the value of : tan⁻¹ (1) + cos⁻¹ (-1/2) + sin⁻¹ (-1/2).
2. Prove :  tan⁻¹ x + tan⁻¹ (2x / (1-x²)) = tan⁻¹ (3x-x³ / (1-3x²)), |x|< 1 / √3
3. If tan⁻¹ (x+1) / x + tan⁻¹ (2x / 1-x²) = x⁻¹, then find the value of x.
4. Find the value of \( \sin \left( \frac{\pi}{3} - \sin^{-1} \left( -\frac{1}{2} \right) \right) \)

5. Prove: \( \sin^{-1} \frac{12}{13} + \cos^{-1} \frac{4}{5} + \tan^{-1} \frac{63}{16} = \pi \)

6. Solve: \( \tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4} \)

7. Prove: \( \frac{9\pi}{8} - \frac{9}{4} \sin^{-1} \frac{1}{3} = \frac{9}{4} \sin^{-1} \frac{2\sqrt{2}}{3} \)

8. Solve: \( \sin^{-1} (1 - x) - 2\sin^{-1} x = \frac{\pi}{2} \)

9. Evaluate: \( \tan^{-1} \sqrt{3} - \sec^{-1} (-2) + \cosec^{-1} \frac{2}{\sqrt{3}} \)

10. Prove: \( \tan^{-1} \left( \frac{\sqrt{1 + \cos x} + \sqrt{1 - \cos x}}{\sqrt{1 + \cos x} - \sqrt{1 - \cos x}} \right) = \frac{\pi}{4} + \frac{x}{2} \)

11. Simplify: \( \sin^{-1} \left( \frac{x + \cos x}{\sqrt{2}} \right) \)

12. Prove: \( \sec^2 (\tan^{-1} 2) + \cosec^2 (\cot^{-1} 3) = 15 \)

13. Simplify: \( \tan^{-1} \left( \frac{a \cos x - b \sin x}{b \cos x + a \sin x} \right) \)

14. Prove: \( \tan^{-1} \frac{1}{5} + \tan^{-1} \frac{1}{7} + \tan^{-1} \frac{1}{3} + \tan^{-1} \frac{1}{8} = \frac{\pi}{4} \)

15. If \( \sin \left( \sin^{-1} \frac{1}{5} + \cos^{-1} x \right) = 1 \), then find the value of x.

16. Prove that: \( 2 \tan^{-1} \left( \frac{a - b}{\sqrt{a + b} \tan \frac{\theta}{2}} \right) = \cos^{-1} \left( \frac{a \cos \frac{\theta}{b} + \frac{b \cos \theta}{a + b} \cos \frac{\theta}{b}} \right) \)

17. Find the principal value of \( \sec^{-1} (-\sqrt{2}) \)

18. Find value of: \( \sin \left[ \tan^{-1} \frac{1 - x^2}{2x} + \cos^{-1} \frac{1 - x^2}{1 + x^2} \right] \)

**CHAPTER III & IV: MATRICES AND DETERMINANTS**

1. Find x, y, z if: \( \begin{pmatrix} 2 & 1 & 1 \\ 0 & y & 2 \\ 1 & 2 & z \end{pmatrix} = (0 \ 0 \ 1) \)

2. If \( A = \begin{pmatrix} 3 & -5 \\ -4 & 2 \end{pmatrix} \), show that \( A^2 - 5A - 14I = 0 \) and hence find \( A^{-1} \)

3. Using properties of determinants solve for x:
   \[
   \begin{vmatrix}
   a + x & a - x & a - x \\
   a - x & a + x & a - x \\
   a - x & a - x & a + x
   \end{vmatrix} = 0
   \]

4. Using properties of determinants prove that:
   \[
   \begin{vmatrix}
   b + c & c + a & a + b \\
   q + r & r + p & p + q \\
   y + z & z + x & x + y
   \end{vmatrix} = 2 \begin{vmatrix}
   a & b & c \\
   p & q & r \\
   x & y & z
   \end{vmatrix}
   \]

5. If \( X = \begin{pmatrix} \cos \alpha & \sin \alpha \\ -\sin \alpha & \cos \alpha \end{pmatrix} \), prove that \( X^n = \begin{pmatrix} \cos n\alpha & \sin n\alpha \\ -\sin n\alpha & \cos n\alpha \end{pmatrix} \), \( n \in \mathbb{N} \)

6. Using properties of determinants, prove that:
   \[
   \begin{vmatrix}
   b + c & c + a & a + b \\
   c + a & a + b & b + c \\
   a + b & b + c & c + a
   \end{vmatrix} = 2(a + b + c)(ab + bc + ca - a^2 - b^2 - c^2)
   \]

7. Using properties of determinants prove that:
   \[
   \begin{vmatrix}
   a - b - c & 2a & 2a \\
   2b & b - c - a & 2b \\
   2c & 2c & c - a - b
   \end{vmatrix} = -(a + b + c)^3
   \]
8. If \( A = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix} \), \( B = \begin{bmatrix} 5 & 7 \\ 2 & 4 \end{bmatrix} \), \( C = \begin{bmatrix} 2 & 5 \\ 3 & 8 \end{bmatrix} \), find a matrix \( D \) such that \( CD - AB = 0 \).

9. If \( A = \begin{bmatrix} 3 \\ 1 \\ -1 \end{bmatrix} \), using principle of mathematically induction, prove that for \( n \in \mathbb{N} \)
\[ A^n = \begin{bmatrix} 1 + 2n \\ 2n \end{bmatrix} \]

10. Using properties of determinants, prove that
\[ \begin{vmatrix} \sin \alpha & \cos \alpha & \cos(\alpha + \delta) \\ \sin \beta & \cos \beta & \cos(\beta + \delta) \\ \sin \gamma & \cos \gamma & \cos(\gamma + \delta) \end{vmatrix} = 0. \]

11. Let \( A = \begin{bmatrix} 1 & -2 \\ -2 & 3 \end{bmatrix} \), verify that \( [\text{Adj}A]^{-1} = \text{Adj}(A^{-1}) \)

12. If \( A = \begin{bmatrix} 3 \\ 4 \\ 1 \end{bmatrix} \), find \( k \) so that \( A^{-1} = kA - 2I \)

13. Find \( X \) and \( Y \) if \( 3X - Y = \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix} \) and \( X - 3Y = \begin{bmatrix} 0 \\ 1 \\ -1 \end{bmatrix} \)

14. For what value of \( a \) and \( b \), the system of equations
\[ 2x + ay + 6z = 8; \quad x + 2y + bz = 5; \quad x + y + 3z = 4 \]
has
(i) a unique solution
(ii) infinitely many solutions
(iii) no solution.

15. Find \( B \), if \( A = \begin{bmatrix} 2 \\ -3 \\ 5 \end{bmatrix} \), \( B = \begin{bmatrix} 17 \\ 47 \\ -13 \end{bmatrix} \)

16. If \( A = \begin{bmatrix} 3 \\ 4 \\
7 \\ 5 \end{bmatrix} \), find \( a \) and \( b \) such that \( A^2 + aI = bA \) where \( I \) is unit matrix of order 2.

17. Express \( A = \begin{bmatrix} 6 & 1 \\ 3 & 4 \end{bmatrix} \) as a sum of a symmetric and a skew–symmetric matrix.

18. Prove using properties of determinants:
\[ \begin{vmatrix} 3a & -a + b & -a + c \\ -b + a & 3b & -b + c \\ -c + a & -c + b & 3c \end{vmatrix} = 3(a+b+c)(ab+bc+ca) \]

19. Solve the equations by matrix method
\[ x + y + z = 3; \quad 2x - y + z = 2; \quad x - 2y + 3z = 2. \]

20. If \( A = \begin{bmatrix} 1 & 1 \\ 2 & -3 \\ 1 & 2 \end{bmatrix} \), find \( A^{-1} \) and use it to solve the system of equations:
\[ x + y + 2z = 0 \]
\[ x + 2y - z = 9 \]
\[ x - 3y + 3z = -14 \]

21. Find the value of \( \lambda \) for which given homogeneous system of equations have non trivial solution. Also find the solution of the given equations.
\[ \begin{align*}
2x + 3y - 2z &= 0 \\
2x - y + 3z &= 0 \\
7x + \lambda y - z &= 0
\end{align*} \]

22. If \( A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix} \) and \( B = \begin{bmatrix} 3 & 1 & -1 \\ 1 & 3 & 1 \\ -1 & 1 & 3 \end{bmatrix} \)
, find the product \( AB \) and use this result to solve the following system of equations:
\[ \begin{align*}
2x - y + z &= -1; \quad -x + 2y - z = 4; \quad x - y + 2z = -3.
\end{align*} \]

23. For what value of \( a \) and \( b \), the following system of equations is consistent?
\[ \begin{align*}
x + y + z &= 6 \\
2x + 5y + az &= b \\
x + 2y + 3z &= 14
\end{align*} \]
24. Prove using properties of determinants:
\[
\begin{vmatrix}
1 + a^2 - b^2 & 2ab & -2b \\
2ab & 1 - a^2 + b^2 & 2a \\
2b & -2a & 1 - a^2 - b^2
\end{vmatrix} = (1 + a^2 + b^2)^2
\]

25. If \( A = \begin{bmatrix} 0 & -\tan \frac{\alpha}{2} \\ \tan \frac{\alpha}{2} & 0 \end{bmatrix} \), and \( I \) be the identity matrix of order 2.

Show that \( I + A = (I - A) \begin{bmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{bmatrix} \)

26. If \( f(x) = x^2 - 4x + 1 \), find \( f(A) \) when \( A = \begin{pmatrix} 2 & 3 \\ 1 & 2 \end{pmatrix} \)

27. Show that \( A = \begin{pmatrix} 5 & 3 \\ -1 & -2 \end{pmatrix} \) satisfies the equation \( x^2 - 3x - 7 = 0 \). Thus, find \( A^{-1} \).

28. Express the matrix \( A = \begin{pmatrix} 1 & 3 & 5 \\ -6 & 8 & 3 \\ -4 & 6 & 5 \end{pmatrix} \) as the sum of a symmetric and the skew symmetric matrix.

CHAPTER V: CONTINUITY AND DIFFERENTIATION

1. Find the values of \( a \) and \( b \) such that the function defined by \( f(x) = \begin{cases} 5 & \text{if } x \leq 2 \\ ax + b & \text{if } 2 < x < 10 \\ 21 & \text{if } x \geq 10 \end{cases} \) is a continuous function.

2. Find \( \frac{dy}{dx} \) of \( \sin^2 y + \cos(xy) = p \)

3. Differentiate \( (x \cos x)^x + (x \sin x)^{1/x} \) w.r.t. \( x \).

4. If \( x = \sqrt[3]{a \sin^{-1} y}, y = \sqrt[3]{a \cos^{-1} y} \), show that \( \frac{dy}{dx} = -y \).

5. If \( y = (\tan^{-1} x)^2 \), show that \( (x^2 + 1)^2 y_x + 2x(x^2 + 1) y_1 = 2 \).

6. Differentiate \( \sin^{-1} \left( \frac{2x+1}{1+4x} \right) \) w.r.t. \( x \).

7. If \( x \sqrt{1+y} + y \sqrt{1+x} = 0 \) for \(-1 < x < 1\), show that \( \frac{dy}{dx} = \frac{-1}{(1+x)^2} \).

8. Find \( \frac{dy}{dx} \) if \( y = a^{t+a}, x = (t + 1/t)^a \)

9. Discuss the continuity of the function given by:
\[
f(x) = \begin{cases}
|x - 1| + |x - 2| & \text{at } x = 1, \text{ and } x = 2.
\end{cases}
\]

10. If the function \( f(x) \) is given by \( f(x) = \begin{cases} (3ax + b) & \text{if } x > 1 \\ 11 & \text{if } x = 1 \\ 5ax - 2b & \text{if } x < 1 \end{cases} \) is continuous at \( x = 1 \), find the values of \( a \) and \( b \).

11. If \( y = [x + \sqrt{x^2 + a^2}]^n \), then prove that \( \frac{dy}{dx} = \frac{ny}{\sqrt{x^2 + a^2}} \)

12. Prove:
\[
\frac{d}{dx} \left[ \frac{x}{2} \sqrt{a^2 - x^2} + \frac{a^2}{2} \sin^{-1} \frac{x}{a} \right] = \sqrt{a^2 - x^2}
\]

13. Find \( \frac{dy}{dx} \) when \( y = \sec^{-1} \left( \frac{x+1}{x-1} \right) + \sin^{-1} \left( \frac{x-1}{x+1} \right) \)

14. If \( e^x + e^y = e^{x+y} \), prove that \( \frac{dy}{dx} = \frac{e^x(e^y - 1)}{e^y(e^x - 1)} \)

15. Given that \( \frac{\cos x}{2} \cos \frac{x}{4} \cos \frac{x}{8} \ldots = \frac{\sin x}{x} \) prove that
16. If \( x = a(t + \sin t) \), \( y = a(1 + \cos t) \), prove that \( \frac{d^2 y}{dx^2} = -\frac{a}{y^2} \).

17. \( x^y = e^{x-y} \), show that \( \frac{dy}{dx} = \frac{\log x}{(1 + \log x)^2} \).

18. Find the value of ‘k’ if \( f(x) = \begin{cases} 
\frac{k \cos x}{\pi - 2x} & \text{if } x \neq \frac{\pi}{2} \\
3 & \text{if } x = \frac{\pi}{2}
\end{cases} \) is continuous at \( x = \frac{\pi}{2} \).

19. If \( y = \tan^{-1}\left[ \frac{\sqrt{1+x^2} - \sqrt{1-x^2}}{\sqrt{1+x^2} + \sqrt{1-x^2}} \right] \), find \( \frac{dy}{dx} \).

20. If \( \cos y = x \cos^2 (a + y) \), with \( \cos a \neq 1 \), prove that \( \frac{dy}{dx} = \frac{\cos^2 (a + y)}{\sin a} \).

21. Differentiate \( y = (x \cos x)^x + (x \sin x)^x \).

22. Find \( \frac{dy}{dx} \) if \( y = \sec^{-1}\left( \frac{\sqrt{x} + 1}{\sqrt{x} - 1} \right) + \sin^{-1}\left( \frac{\sqrt{x} - 1}{\sqrt{x} + 1} \right) \).

23. Find \( \frac{dy}{dx} \) if \( y = \cos^{-1}\left( \frac{x - 1}{x + \frac{1}{x}} \right) \).

24. Prove that \( \frac{d}{dx}\left( \frac{x}{2} \sqrt{a^2 - x^2} + \frac{a^2}{2} \sin^{-1}\frac{x}{a} \right) = \sqrt{a^2 - x^2} \).

25. If \( (x + y)^{m+n} = x^m y^n \), show that \( \frac{dy}{dx} = \frac{y}{x} \).

26. If \( \sqrt{1-x^6} + \sqrt{1-y^6} = a(x^3 - y^3) \), P.T. \( \frac{dy}{dx} = \sqrt{1-y^6} \).

27. If \( \sqrt{\cos x + \sqrt{\cos x + \sqrt{\cos x + \ldots}}} \), P.T. \( (2y - 1) \frac{dy}{dx} \sin x = 0 \).

28. If \( y\sqrt{x^2 + 1} = \log\left[ \sqrt{x^2 + 1 - x} \right] \), show that \( (x^2 + 1) \frac{dy}{dx} + xy + 1 = 0 \).

**CHAPTER – VI: APPLICATION OF DERIVATIVES**

1. If \( y = x^4 - 10 \) and if \( x \) changes from 2 to 1.99, what is the approximate change in \( y \).

2. A circular plate expands under heating so that its radius increases by 2%. Find the approximate increase in the area of the plate if the radius of the plate before heating is 10 cm.

3. Find the approximate value of \( f(3.02) \) when \( f(x) = 3x^2 + 5x + 3 \).

Using differentials find the approximate value of

4. \( \sqrt{25.2} \)

5. \( \sqrt{0.037} \)
6. \( \tan 46^\circ \), given \( 1^\circ = 0.01745 \) radians.

7. Find intervals in which the function given by \( f(x) = \frac{3}{10}x^4 - \frac{4}{5}x^3 - 3x^2 + \frac{36}{5}x + 11 \) is
   (a) strictly increasing (b) strictly decreasing.

8. Show that the function \( f \) given by \( f(x) = \tan^{-1}(\sin x + \cos x), x > 0 \) is always an strictly increasing function in \( \left( 0, \frac{\pi}{4} \right) \).

Find the intervals in which the following functions are increasing or decreasing

9. \( f(x) = -x^2 - 2x + 15 \).
   10. \( f(x) = 2x^3 + 9x^2 + 12x + 20 \)

11. \((x+1)^3(x-3)^3\).
   12. \( x^4 - x^3 \)

13. \( f(x) = \sin 3x \).
   14. \( f(x) = \sin x + \cos x \).

15. \( f(x) = \sin^4 x + \cos^4 x \) on \([0, \pi/2]\)
   16. \( f(x) = \log(1+x) - \frac{x}{x+1} \)

17. Find the maximum slope of the curve \( y = -x^3 + 3x^2 + 2x - 27 \) and what point is it?

18. A right circular cone of maximum volume is inscribed in a sphere of radius \( r \), find its altitude. Also show that the maximum volume of the cone is \( 8/27 \) times the volume of the sphere.

19. A point on the hypotenuse of a triangle is at a distance \( a \) and \( b \) from the sides of the triangle. Show that the maximum length of the hypotenuse is \( \left( \frac{a^2 + b^3}{3} \right)^{1/3} \).

20. From a piece of tin 20cm. in square, a simple box without top is made by cutting a square from each corner and folding up the remaining rectangular tips to form the sides of the box. What is the dimension of the squares is cut in order that the volume of the box is maximum.

21. If length of three sides of a trapezium other than base are equal to 10cm, then find the area of the trapezium when it is maximum.

22. Find the shortest distance of the point \((0,c)\) from the parabola \( y = x^2 \), where \( 0 \leq x \leq 5 \).

23. A window consists of a rectangle surmounted by a semicircle. If the perimeter of the window is \( p \) centimetres, show that the window will allow the maximum possible light when the radius of the semi circle will be \( \frac{p}{\pi + 4} \) cm.

24. Show that the semi vertical angle of the cone of given surface area and maximum volume is \( \sin^{-1}\left(\frac{1}{3}\right) \).

25. A wire of length \( a \) is cut into two parts which are bent respectively in the form of a square and a circle. Show that the least value of the areas so formed is \( \frac{\pi^2}{4(\pi + 4)} \).

26. Show that the volume of the greatest cylinder which can be inscribed in a cone of height \( h \) and semi vertical angle \( \alpha \) is \( \frac{4}{27} \pi h^2 \tan^2 \alpha \).

27. An open tank with square base and vertical sides is to be constructed from metal sheet so as to hold a given quantity of water. Show that the cost of material will be least when the depth of the tank is half the width.

28. Find the area of the greatest isosceles triangle that can be inscribed in a given ellipse \( \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \) having its vertex coincident with one end of the major axis.

29. Find the maximum and minimum points for the following:
   (i) \( \frac{x^2 + x + 1}{x^2 - x + 1} \)
   (ii) \( (x - 8)^4(x - 9)^5 \)
   (iii) \( (x - 2)^4(x - 3)^5 \)
30. The section of a window consists of a rectangle surmounted by an equilateral triangle. If the perimeters be given as 16 m. find the dimensions of the window in order that the maximum amount of light may be admitted.

31. A square tank of capacity 250 cu.m has to be dug out. The cost of land is Rs. 50 per sq.m. The cost of digging increases with the depth and for the whole tank is 400(depth)^2 rupees. Find the dimensions of the tank for the least total cost.

32. Find the dimensions of the rectangle of greatest area that can be inscribed in a semi circle of radius r.

33. A running track of 440 ft is to be laid out enclosing a football field, the shape of which is rectangle with semicircle at each end. If the area of the rectangular portion is to be maximum find the length of the sides.

34. Find the maximum and minimum values of \( y = |4-x^2|, -3 \leq x \leq 3 \). Also determine the greatest and least values.

35. Whether \( \frac{x}{a} + \frac{y}{b} = 2 \) touch \( \left( \frac{x}{a} \right)^2 + \left( \frac{y}{b} \right)^2 = 2 \). If so find the point of contact.

36. Find points at which the tangent to the curve \( y = x^3 - 3x^2 - 9x + 7 \) is parallel to the x-axis.

37. Show that the tangents to the curve \( y = 7x^3 + 11 \) at the points where \( x = 2 \) and \( x = -2 \) are parallel.

38. Find the points on the curve \( y = x^3 \) at which the slope of the tangent is equal to the y-coordinate of the point.

39. Find the equations of the normals to the curve \( y = x^3 + 2x + 6 \) which are parallel to the line \( x + 14y + 4 = 0 \).

40. Find the equation of the tangent to the curve \( y = \sqrt{3x - 2} \) which is parallel to the line \( 4x - 2y + 5 = 0 \).

41. Find the equation of the tangent to \( x^3 + y^3 = 8xy \) where it meets \( y^2 = 4x \) other than the origin.

42. Show that the normal at \( q \) to \( x = a\cos q + a\cos q \) and \( y = a\sin q - a\cos q \) is at constant distance from the origin.

43. Find the equation of the normal to \( x^3 + y^3 = 8xy \) where it meets \( y^2 = 4x \) other than the origin.

44. Show that \( \frac{x}{a} + \frac{y}{b} = 1 \) touches \( y = be^{\frac{x}{a}} \) at the point where the curve crosses y-axis.

45. Find the angle of intersection of the curves \( xy = a^2 \) and \( x^2 + y^2 = 2a^2 \).

46. Find the equation(s) of normal(s) to the curve \( 3x^2 - y^2 = 8 \) which is (are) parallel to the line \( x + 3y = 4 \).

47. For the curve \( y = 4x^3 - 2x^5 \), find all the points at which the tangent passes through the origin.

48. Prove that the sum of intercepts of the tangent to the curve \( \sqrt{x} + \sqrt{y} = \sqrt{a} \) with the co-ordinate axes is constant.

CHAPTER – XII : LINEAR PROGRAMMING

Q. 1. One kind of cake requires 200 gm of flour and 25 gm of fat, and another kind of cake requires 100 gm of flour and 50 gm of fat. Find the maximum number of cakes which can be made from 5 kg of flour and 1 kg of fat assuming that there is no shortage of the other ingredients used in making the cakes.

Q. 2. A dietician wishes to mix together two kinds of food X and Y in such a way that the mixture contains at least 10 units of vitamin A, 12 units of vitamin B and 8 units of vitamin C. The Vitamin contents of one Kg food is given below :-
<table>
<thead>
<tr>
<th>Food</th>
<th>Vitamin A</th>
<th>Vitamin B</th>
<th>Vitamin C</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Y</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

One kg of food X costs Rs. 16 and one Kg of food Y costs Rs. 20. Find the least cost of the mixture which will produce the required diet.

Q. 4. An aeroplane can carry a maximum of 200 passengers. A profit of Rs. 1000 is made on each executive class ticket and a profit of Rs. 600 is made on each economy class ticket. The airline reserves at least 20 seats for executive class. However, at least 4 times as many passengers prefer to travel by economy class than by the executive class. Determine how many tickets of each type must be sold in order to maximise the profit for the airline. What is the maximum profit.

Q. 5. Two godowns A and B have grain capacity of 100 quintals and 50 quintals respectively. They supply to 3 ration shops, D, E and F whose requirements are 60, 50 and 40 quintals respectively. The cost of transportation per quintal from the godowns to the shops are given in following table:

<table>
<thead>
<tr>
<th>From / To</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>E</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>F</td>
<td>2.50</td>
<td>3</td>
</tr>
</tbody>
</table>

How should the supplies be transported in order that the transportation cost is minimum. What is the minimum cost.

Q. 6. Two tailors A and B earn Rs. 150 and Rs. 200 per day respectively. A can stitch 6 shirts and 4 pants per day, while B can stitch 10 shirts and 4 pants per day. Form a linear programming problem to minimize the labour cost to produce at least 60 shirts and 32 pants.

Q. 7. A dealer wishes to purchase a number of fans and sewing machines. He has only Rs 5,760 to invest and has space for at most 20 items. A fan costs him Rs. 360 and a sewing machine Rs 240. His expectation is that he can sell a fan at a profit of Rs. 22 and a sewing machine at a profit of Rs. 18. Assuming that he can sell all the items that he can buy, how should he invest his money in order to maximise his profit.

Q8. If a young man drives his vehicle at 25 km/hr, he has to spend Rs. 2/km on petrol. If he drives it at a faster speed of 40km/hr, the petrol cost increases to Rs. 5/km. He has Rs. 100 to spend on petrol and travel within one hour. Express this as an L.P.P. and solve.

Q. 9. A factory makes tennis rackets and cricket bats. A tennis racket takes 1.5 hours of machine time and 3 hours of craftman’s time in its making while a cricket bat takes 3 hour of machine time and 1 hour of craftman’s time. In a day, the factory has the availability of not more than 42 hours of machine time and 24 hours of craftman’s time.

i. What number of rackets and bats must be made if the factory is to work at full capacity?
ii. If the profit on a racket and on a bat is Rs 20 and Rs 10 respectively, find the maximum profit of the factory when it works at full capacity.

Q. 10. A merchant plans to sell two types of personal computers – a desktop model and a portable model that will cost Rs 25000 and Rs 40000 respectively. He estimates that the total monthly demand of computers will not exceed 250 units. Determine the number of units of each type of computers which the merchant should stock to get maximum profit if he does not want to invest more than Rs 70 lakhs and if his profit on the desktop model is Rs 4500 and on portable model is Rs 5000.

Q. 11. A medical company has factories at two places A and B. From these places, supply is made to each of its three situated at P, Q and R. The monthly requirements of the agencies are respectively 40 , 40 and 50 packets of the medicine while the production capacity of factories A and B are 60 and 70 packets respectively. The transportation cost per packet from the factories to the agencies are given below:

<table>
<thead>
<tr>
<th>To / From</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>Q</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>R</td>
<td>30</td>
<td>50</td>
</tr>
</tbody>
</table>

How many packets from each factory be transported to each agency so that cost of transportation is minimum? Also find the minimum cost?

Q. 12. A man owns a field of area 1000 sq meter. He wants to plant trees in it. He has a sum of Rs. 1400 to purchase young trees. He has the choice of two types of trees. Type A requires 10 sq meter of ground per tree and costs Rs. 20 per tree and type B requires 20 sq meter of ground per tree and costs Rs. 25 per tree. When fully grown, type A produces an average of 20 kg of fruits which can be sold at a profit of Rs. 2 per kg and type B produces an average of 40 kg of fruits which can be sold at a profit of Rs. 1.50 per kg. How many trees of each type should be planted to achieve maximum profit when the trees are fully grown? What is the maximum profit?

Q.13. A firm is engaged in breeding goats. The goats are fed on various products grown on the farm. They need certain nutrients, named as X, Y and Z. The goats are fed on two products A and B. One unit of product A contain 36 units of X, 3 units of Y and 20 units of Z, while one unit of products B contain 6 units of X , 12 units of Y and 10 units of Z. The minimum requirement of X,Y and Z is 108 units , 36 units and 100 units respectively. Product A costs Rs. 20 per unit and product B costs Rs. 40 per unit. How many units of each product must be taken to minimize the cost.

SCIENCE
1. Make a project on the Topic selected by you.
2. Revise all the chapters of unit iv and v and prepare for Unit Test II.

HOME SCIENCE
1.) Cook one day menu for your family in dependently.
2.) Observe how clothes are washed at your home and note down your observations.
3.) Make samples for testing fasteners on given samples for practical file.
4.) Collect pictures from magazines for your practical file, according to your syllabus.

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