MAT 112
PAST QUESTIONS

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1. Find the equation of the line through (-3,2)
   a. $y = 5x + 17$
   b. $y = 2x + 4$
   c. $y = 3x + 13$
   d. $y = 7x - 17$

2. If $p(x, y)$ is an arbitrary point on the line, then, $y = mx + c$, where m is the slope of the line and c is they y – intercept is called
   a. the linear form
   b. the slope intercept form
   c. the intercept form
   d. the quadratic form

3. The distance from a point (x_1, y_1) to the straight line $ax + by + c = 0$ is
   a. $\dfrac{ax_1 + by_1 + c}{a^2 + b^2}$
   b. $\dfrac{ay_1 + bx_1 + c}{a^2 + b^2}$
   c. $\dfrac{cx_1 + bx_1 + c}{a^2 + b^2}$
   d. $\dfrac{ax_1 + by_1 + c}{a^2 + b^2}$

4. When the vertex of the prarabola $x^2 = 4by$ is translated to the point (x_1, y_1), the equation of the corresponding parabola will become
   a. $(x - x_1)^2 = 4b(y - y_1)$
   b. $(x - x_1)^2 = 4b(x - x_1)^2$
   c. $(x - x_1)^2 = 4a(y - y_1)$
   d. $(x - x_1)^2 = 4a(x - x_1)^2$

Use the equation of the parabola below to answer questions 5 – 7. $y^2 - 4y - 2x + 18 = 0$

5. What is the vertex of the parabola
   a. (2,7)
   b. (7,2)
   c. (-2, 7)
   d. (-7, -2)

6. What is the focus of the parabola
   a. $(^{15}/_2, 2)$
   b. $(2, \,^{15}/_2,)$
   c. $(-^{15}/_2, -2)$
   d. $(-2, -^{15}/_2,)$

7. What is the directrix of the parabola
   a. $x = \,^2/_{13}$
   b. $x = -\,^2/_{13}$
   c. $x = \,^{13}/_2$
   d. $x = -\,^{13}/_2$

8. Obtain the acceleration of the position vector $r(t) = 3t^2\mathbf{i} - (2t^3 + t)\mathbf{j} - t^4\mathbf{k}$ at $t = 1$ sec.
   a. $a = 6\mathbf{i} - 12\mathbf{j} - 12\mathbf{k}$
   b. $a = -6\mathbf{i} - 12\mathbf{j} - 12\mathbf{k}$
   c. $a = 6\mathbf{i} + 12\mathbf{j} - 12\mathbf{k}$
   d. $a = 6\mathbf{i} - 12\mathbf{j} + 12\mathbf{k}$

9. If a mass of 2.6kg has an acceleration of 1.2m/s2. what force is acting on it?
   a. 3.02N
   b. 3.12N
   c. 3.22N
   d. 3.32N

10. Evaluate the area of the parallelogram whose diagonals are given by the vectors
    $\mathbf{a} = -\mathbf{i} - 3\mathbf{j} + 4\mathbf{k}$; $\mathbf{b} = 3\mathbf{i} + \mathbf{j} - 4\mathbf{k}$
    a. $5\sqrt{3}$
    b. $5\sqrt{4}$
    c. $3\sqrt{4}$

d. 4 $\sqrt{3}$

11. If a force of 7N acts on a mass of 3.2kg. find is acceleration
    a. 2.1575m/s2
    b. 2.1675m/s2
    c. 2.1775m/s2
    d. 2.1875m/s2

12. Find the value of α if the vectors $\underline{x} = 3\underline{i} + a\underline{j} + 5\underline{k}$; $\underline{y} = 2\underline{i} - \underline{j} + \underline{k}$ and $\underline{z} = i t 2j - 3k$ are coplanar
    a. – 2
    b. 4
    c. – 3
    d. 2

Use the information below to answer questions 13 – 14
A particle A of mass 0.5 units moving with velocity $(2\underline{i} + 3\underline{j})$ m/s collides with a stationary particle B of mass 1.5 units. The velocity of B after impact is $(5\underline{i} + \underline{j})$ m/s

13. Find the velocity of A after impact.
    a. 13$\underline{i}$+ 3$\underline{j}$
    b. 13$\underline{i}$
    c. 20i
    d. 13$\underline{i}$ – 15$\underline{j}$

14. Determine the magnitude of the impulse between the particles.
    a. $\sqrt{\left(\frac{15}{2}\right) + \left(\frac{3}{2}\right)^2}$
    b. $\sqrt{\left(\frac{15}{2}\right)^2}$
    c. $\sqrt{\left(\frac{3}{2}\right)^2}$
    d. $\sqrt{\left(\frac{15}{2}\right)^2 \left(\frac{3}{2}\right)^2}$

15. A ball of mass 200g moving at 15 m/s hits a wall perpendicular and rebounds with speed 6m/s. what force acting between them if the contact lasts 0.01 sec.
    a. – 420N
    b. – 430N
    c. – 440N
    d. – 450N

16. The plane is divided into ____ equal parts of two perpendicular lines denoted as x and y axes
    a. 2
    b. 4
    c. 6
    d. 8

17. The distance between the points P(a,2a) and Q(-3a, -a) is
    a. 5a
    b. $\sqrt{5}$ a
    c. $\sqrt{5}$
    d. – 5a

18. The mid-point A of the line joining P(3, -2) and Q(5,8) is
    a. (4,3)
    b. (3,4)
    c. (8,6)
    d. (5,8)

19. Given the points A(1,-2) and B(4,1), find the coordinates of the point that divides the line AB in the ratio 1:2
    a. (2,1)
    b. (-2,1)
    c. (-2,-1)
    d. (2,-1)

20. What is the equation of the straight line parallel to the x-axes and meeting the y-axes at the point (0,3)?
    a. x = y + 3
    b. y = x + 3
    c. y = 3
    d. x = 3

the lines ; $2x + y + 3 = 0$ and $x + 2y - 1 = 0$
Form the two side of a rectangle whose other sides meet at the point $(3,4)$

21.   The equations of the other sides and
        a. $2y = x - 5$ $y = 2x - 10$
        b. $y = x - 5$ $2y = 2x - 10$
        c. $2y = x + 5$ $y = 2x + 10$
        d. $y = x + 5$ $y = -2x + 10$

22.   The area of the rectangle is
        a. $\dfrac{52}{5}$

        b. $\sqrt[5]{52}$

        c. $\dfrac{9}{5}$

        d. $\sqrt[5]{9}$

23.   The equation of the circle center $(3,5)$, radius 2 is
        a. $x^2 + y^2 + 6x + 10y - 30 = 0$
        b. $y^2 + x^2 + 4x + 10y - 20 = 0$
        c. $x^2 + y^2 - 6x - 10y - 30 = 0$
        d. $x^2 + 6x + y^2 + 10y - 20 = 0$

24.   What is the center of the circle?
        a. $(3,4)$
        b. $(-3, 4)$
        c. $(3,0)$
        d. $(0,3)$

25.   What is the equation of diameter which passes through the point $(7,3)$
        a. $2y = 3x + 3$
        b. $y = 3$
        c. $y = -3$
        d. $2y - 3x - 3$

26.   The equation of a parabola with the focus $(a,0)$ and the directrix $x = -a$ is
        a. $x^2 = -4ay$
        b. $x^2 = -4ax$
        c. $x^2 = 4ay$
        d. $y^2 = 4ax$

27.   Write the equation in its canonical form
        a. $\dfrac{(x-2)^2}{25} + \dfrac{(y+1)^2}{4} = 1$
        b. $25(x^2 - 4x) + 4(y^2 + 2y) = 59$
        c. $\dfrac{(x-2)^2}{4} + \dfrac{(y+1)^2}{25} = 1$
        d. $25(x^2 - 4x) + 4(y^2 + 2y) = 1$

28.   The vertices on the vertical axes are
        a. $(2,4)$ $(-2,6)$
        b. $(-2,4)$ $(2,-6)$
        c. $(2,4)$ $(2,6)$
        d. $(2,4)$ $(2,-6)$

29.   Which of the following is true about a vector quantity
        a. it has magnitude without direction
        b. it has direction without magnitude
        c. it has both magnitude and direction
        d. it has neither magnitude nor direction

30. The point P divides the line AB in the ratio m:n If M:n is positive then the point P lies
    a. in between the point A and B
    b. Outside A and B
    c. beside A
    d. beside B

31. Evaluate the volumes of the parallelepiped whose sides are given by vectors
    $\underline{a} = 2i - 2j + k$ $\underline{b}. = I + j - k$ $\underline{c}. 3i - 2j + k$
    a. 1
    b. 2
    c. 3
    d. 4

32. Find the projection of the vector
    $A = I - 2j + k$ on vector $b = 2i - 2j - k$
    a. 3/5
    b. 5/3
    c. 5
    d. 3

33. Find the vector to the hyperbola $25x^2 - 4y^2 = 100$
    a. (-2, 0), (2, 0)
    b. (-2, 2), (2, 0)
    c. (0, -2), (-2, 0)
    d. (2, 0), (-2, -2)

34. Find the foci to the hyperbola $25x^2 - 4y^2 = 100$
    a. $\left(-\sqrt{29},0\right), \left(\sqrt{29},0\right)$
    b. $\left(\sqrt{29},2\right), \left(\sqrt{29},0\right)$
    c. $\left(-\sqrt{29},0\right), \left(-\sqrt{29},0\right)$
    d. $\left(\sqrt{29},0\right), \left(\sqrt{29},0\right)$

35. Write the equation of the hyperbola in its canonical form
    $25x^2 - 4y^2 - 50x - 16y - 91 = 0$
    a. $\dfrac{(x+1)^2}{4} - \dfrac{(y+2)^2}{25} = 1$
    b. $\dfrac{(x-1)^2}{4} - \dfrac{(y+2)^2}{25} = 1$
    c. $\dfrac{(x+1)^3}{4} - \dfrac{(y+1)^2}{25} = 1$
    d. $\dfrac{(x+2)^2}{4} - \dfrac{(y+1)^2}{25} = 1$

36. Find the equation of the tangent to the hyperbola $4x^2 - 9y^2 = 36$ at the point $\left(3\sqrt{2},2\right)$
    a. $3y - 2x + 6 = 0$
    b. $2y - 3x + 6 = 0$
    c. $3y - \sqrt{2}x + 6 = 0$
    d. $3\sqrt{2}y - 2x + 6 = 0$

37. Find the equation of the normal to the hyperbola $4x^2 - 9y^2 = 36$ at the point $\left(3\sqrt{2},2\right)$
    a. $\sqrt{2}y + 3x - 11\sqrt{2} = 0$
    b. $\sqrt{2}y + 3\sqrt{2}x - 11\sqrt{2} = 0$
    c. $2\sqrt{2}y + 3x - 13\sqrt{2} = 0$
    d. $\sqrt{2}y + 3x - 11\sqrt{2} = 0$

38. If the modulus of a vector is unity, it is referred to as a
    a. scalar
    b. vector
    c. unit vector

d. unit scalar

39. The distance between the points P(2a, a) and Q(3a, - 2a) is
a. 10a
b. $\sqrt{10}$ a
c. 10
d. -10a

40. The mid-point A of the line joining P(-3, 2) and Q(5, 8) is
a. (1, 5)
b. (-1, 5)
c. (-1, -5)
d. (1, 5)

41. Given the point A(2, -1) and B(3, - 2), find the coordinates of the point that divides the line AB in the ratio 1:2
a. (7/3, 0)
b. (3/7, 0)
c. (0, 7/3)
d. (0, 3/7)

42. What is the equation of the straight line parallel to the y-axes and meeting the x-axes at the point (3, 0)?
a. x= y +3
b. y= x+3
c. y= 3
d. x= 3

42. Given the point A(2, -1), and B(4, 2), find the equation of the line which is perpendicular to AB through a point P with the ratio AP : PB = 1:3,
a. 12y + 8x + 17 =0
b. y + 8x - 17 =0
c. 12y - 8x + 17 =0
d. 12y + 8x -17 =0

43. Two straight lines y = m1x+c1 and: y= m2x+c2 are said to be perpendicular if
a. m1 + m1 =1
b. m1 m2 =-1
c. m1 =- m2
d. m1 = m2

43. What is the tangent of the angle between the lines y + x =6 and 2y + 4x =3?
a. $-\dfrac{1}{4}$
b. $\dfrac{3}{4}$
c. $-\dfrac{1}{3}$
d. $\dfrac{4}{3}$

Use the information below to answer question 9 and 10 the lines y = x – 5 =0 and 2y -2x + 5 =0 form the two sides of a rectangle whose other sides meet at the pointy (4, 7)

44. The equations of the other sides are
a. y + x + 3 = 0   Y + 2x + 15 = 0
b. y - x - 3 = 0   2Y + 2x - 15 = 0
c. 2y - x - 3 = 0   Y - 2x + 15 = 0
d. y - x - 3 = 0   Y + 2x - 15 = 0

45. The area of the rectangle is
a. 104
b. 21
c. $\sqrt{21}$
d. $\sqrt{104}$

50. The equation of the circle center (3,5), radius 2 is
a. $x^2 + y^2 + 6x + 10y - 30 = 0$

b. $x^2 + y^2 - 6x - 10y - 30 = 0$
c. $x^2 + y^2 + 4x + 10y + 20 = 0$
d. $x^2 + 6x + Y^2 - 10y - 30 = 0$

Use the equation of circle below to answer questions 51 and 52
$x^2 + y^2 + 4x + 10y - 30 = 0$

51.   What is the center of the circle?
        a. $(2, -5)$
        b. $(-2, 5)$
        c. $(2, 5)$
        d. $(-2, -5)$

52.   What is the equation of diameter which passes through the point $(5, 7)$
        a. $3y = 2x + 11$
        b. $3y = 2x - 11$
        c. $3y = -2x + 11$
        d. $3y = -2x - 11$

53.   The equation of a parabola with the focus $(-a, 0)$ and the directrix $x = a$ is
        a. $x^3 = -4ay$
        b. $x^2 = -4ay$
        c. $x^3 = 4ay$
        d. $x^2 = 4ay$

Use the equation of the ellipse below to answer questions 15 and 16

54.   Write the equation in its canonical form
        a. $\dfrac{(x - 2)^2}{25} + \dfrac{(y - 1)^2}{4} =$

        b. $\dfrac{(x - 2)^2}{4} + \dfrac{(y - 1)^2}{25} =$

        c. $25(x^2 - 2x) + 4(y^2 - 4y) = 4$
        d. $25(x^2 - 2x) + 4(y^2 - 4y) = 1$

55.   The vertices on the vertical axes are
        a. $(2, 6), (2, 4)$
        b. $(-2, 6), (-2, 4)$
        c. $(2, 6), (2, -4)$
        d. $(-2, 6), (2, -4)$

56.   Which of the following is true about a scalar quantity?
        a. It has magnitude without direction
        b. It has direction without magnitude
        c. It has both magnitude and direction
        d. it has neither magnitude nor direction

57.   The point P divides the line AB in the ratio $m : n$ if $m : n$ is negative and lies between 0 and -1, then the point P lies
        a. in between the point A and B
        b. outside AB and is closer to A and B
        c. Outside AB and is closer to B than A
        d. beside B

58.   Evaluate the volume of the parallelepiped whose sides are given by vectors
        $\underline{a} = 2i - 3j + k, \quad \underline{b} = 2i + j - k \quad \underline{c} = 3i - 2j + 2k$
        a. 11
        b. 12
        c. 13
        d. 14

59.   Find the projection of the vector $\underline{a} = 2i - 2j - k$ on vector $b = j - 2j + k$
        a. $\dfrac{5}{\sqrt{6}}$

        a. 3

$$\sqrt{6}$$

c. 5
d. 3

60. Find the area of the triangle ABC with co-ordinates P(3,4), Q(9, 7) and R(7,6)
a. 22 square unit
b. 23 square unit
c. 24 square unit
d. 25 square unit

61. What is the slope of the straight line joining the points R(6,9) and M(5,6)?
a. 1
b. 2
c. 3
d. 4

61. Given two vectors a and b. if $\underline{a} \cdot \underline{b} = 0$ and $\underline{a} \neq 0 \neq \underline{b}$, then $\underline{a}$ and $\underline{b}$ are
a. parallel
b. equal
c. adjacent to each other
d. perpendicular

63. Two parallel forces having opposite direction are called
a. like parallel forces
b. like perpendicular forces
c. unlike parallel forces
d. unlike perpendicular forces

64. In the diagram below, if XY = - XZ, find the force P at the point x
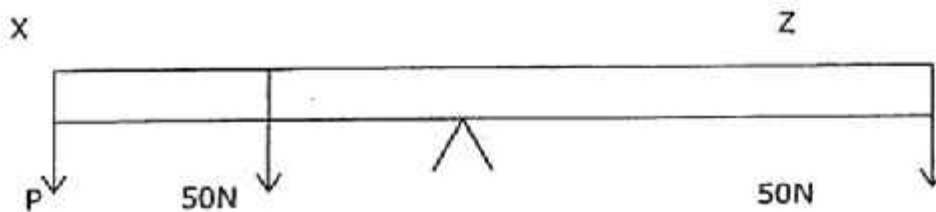
a. $\frac{50}{3}$ N
b. 25N
c. $\frac{25}{6}$N
d. $\frac{25}{6}$N

65. If the three point A, B, C are collinear and distinct then there exist I,m,n such that
a. $l\underline{a} - m\underline{b} - n\underline{c} = 0$
b. $l\underline{a} + m\underline{b} + n\underline{c} = 90^0$
c. $l\underline{a} + m\underline{b} + n\underline{c} = 0$
d. $l\underline{a} + m\underline{b} + n\underline{c} = 360^0$

66. Velocity is an example of a
a. scalar quantity
b. multiple magnitude
c. both scalar and vector quantity
d. neither scalar nor vector quantity

67. The area of the ellipse $\frac{x^2}{100} + \frac{y^2}{64} = 1$ is
a. 70
b. 70π
c. 80π
d. 80

68. The co-ordinates of the foci of the ellipse $\frac{x^2}{100} + \frac{y^2}{64} = 1$ is
a. $(\pm 6, 0)$
b. $(6, 0)$

c. $(\pm 3, 0)$
d. $(3, 0)$

69. Find the equations of the tangents from the point (2,4) to the parabola $y^2 = 6x$
$x^2 - 2y = x - 6$

   a. $2y = 3x - 2$ b. $2y = 3x - 2$
          $2y = 3x - 2$ $2y = -3x + 2$

   c. $2y = x + 6$ d. $2y = -x - 6$
          $2y = 3x + 2$ $2y = -3x - 2$

70. Find the radius of the circles $4x^2 + 4y^2 - 12x + 5 = 0$
   a. 2
   b. 1
   c. 3
   d. 4

71. Find the center of the circle $4x^2 + 4y^2 - 12x + 5 = 0$
   a. (3,0)
   b. (½, 0)
   c. ($^2/_3$, 0)
   d. (2, 0)

72. A couple is a pair of forces with
   a. equal magnitude and direction
   b. equal magnitude but opposite direction
   c. unequal magnitude but same direction
   d. unequal magnitude and opposite direction

73. If a beam is under the influence of a couple (forces); the beam will
   a. be in equilibrium
   b. experience rotational motion
   c. experience oscillatory motion
   d. experience translation motion

74. Find the resultant of two equal coplanar forces each 50N acting at angle 30^0 to each other
   a. $10\sqrt{75}N$
   b. $10\sqrt{50}N$
   c. $10\sqrt{25}N$
   d. $10\sqrt{30}N$

75. If the vector a is represented by AB, the vector $-a$ will be represented by _____

   a. $|r| = x^2 + y^2 + z^2$ b. $|r| = x^2 + \sqrt{y^2 + z^2}$ c. $|r| = x^2 + y^2\sqrt{+z^2}$

   d. $|r| = \sqrt{x^2 - y^2 - z^2}$

76. If the vector a is represented by $\overline{AB}$, the vector $- a$ will be represented by
   a. a
   b. $\overline{BA}$
   c. $-a$
   d. $\overline{AB}$

77. If the point P(x,1) and Q(-6,-5) are eqidistant from the point R(-3,-2). Find the two possible values
for x
   a. X=12 or -6
   b. X=-12 or 6
   c. X= 12 or 6
   d. X= -12 or -6

78. P and Q are the points (3,5) and (-5,-7) respectively. The co-ordinate of the points which divide PQ
internally in the ratio 3:1 is
   a. (3,4)
   b. (-3,4)
   c. (3,-4)
   d. (-3,-4)

79. Find the area of the triangle with co-ordinates P(3,4), Q(9,7) and R(7,6)
   a. 22 square unit
   b. 24 square unit
   c. 23 square unit
   d. 25 square unit
80. What is the slope of the straight line joining the points R(6,9) and M(5,6)
   a. 1
   b. 2
   c. 3
   d. 4
81. If q is scalar and a and b are vectors, then q(a + b)= qa+qb satisfies
   a. Commutative law of scalar multiplication
   b. Associative law of scalar multiplication
   c. Distributive law
   d. Associative law of vector multiplication
82. Given that A= 3i − j − 4k and B= -2i + 4j -3k. Find /A + B/
   a. 50
   b. 59
   c. $\sqrt{50}$
   d. $\sqrt{59}$
83. If C is the perpendicular vector to the vectors a= I +2j − k and b = 2i + j − k. find the value of a · (b × c)
   a. 7
   b. 8
   c. 10
   d. 11
84. Given the points P(X,Y), Q(3,2) and R(9,5). What is the equation of the line PQ
   a. x = 2y − 4
   b. y = 2x − 4
   c. y = x + 4
   d. y = 2x + 4
85. What is the perpendicular distance from the point R to the line PQ
   a. $\frac{9\sqrt{5}}{5}$
   b. $\frac{3\sqrt{5}}{5}$
   c. $\frac{5\sqrt{3}}{3}$
   d. 5
86. What is the equation passing through the point R and is parallel to the line PQ
   a. y = 2x + 13
   b. y = x - 13
   c. y = x + 13
   d. y = 2x − 13
87. What is the equation passing through the point R and is perpendicular to the line PQ
   a. y = -x + 19
   b. y = x + 19
   c. 2y = -x + 19
   d. 2y = x + 19
88. A point R moves so that its distances from two fixed points P (5,3) and Q(7,4) are always equal. Find the equation of the locus of R
   a. x + 2y = 31
   b. x + y = 31
   c. 4x-2y = 31
   d. 4x +2y = 31
89. The point of intersection of two loci 3x − y − 5 = 0 and 12x + y -25 = 0 is
   a. (1,1)
   b. (-2,-1)
   c. (-2,1)
   d. (2,1)

90. A unit vector has
    a. unit magnitude
    b. multiple magnitude
    c. zero magnitude
    d. negative magnitude

91. Given r = 5i -6j – 2k. find |r|
    a. $\sqrt{65}$
    b. 65
    c. $\sqrt{60}$
    d. 60

92. Two or more vectors are said to be coplanar if they are all parallel to the same
    a. Line
    b. Point
    c. Plane
    d. Circle

93. Find the resolved part of the vectors $a = 6i - 3j + 9k$ in the direction of $b = 2i + 2j - K$ respectively
    a. 0
    b. 1
    c. -1
    d. 2

94. Given the points A and B with the vectors a = 4i – k and b = 6i + j - 4k respectively. The vector AB is given by
    a. 10i + j -5k
    b. 10i – 5k
    c. 2i - 3k
    d. 2i + j -3k

95. Two parallel forces having the same direction are called
    a. Like parallel forces
    b. Like perpendicular forces
    c. Unlike parallel forces
    d. Unlike perpendicular forces

96. The sum of the moment of a couple F newtons acting on a beam of lengthy x meters is given
    a. F. x
    b. 2F. x
    c. $\frac{1}{2}$F. x
    d. $\frac{1}{3}$F. x

97. The equation of the plane containing the point A with vector position $a = i + 5j = 3k$ and perpendicular to the vector $2i + 3j + 6k$ is
    a. 2x + 3y + 6z -35 = 0
    b. 2x + 3y + 6z + 35 = 0
    c. 2x - 3y - 6z -35 = 0
    d. 2x + 3y + 6z= 0

98. Evaluate the area of the parallelogram whose diagonal are the vectors $a = I - 3j + 4k$ and $b = 3i + j - 2k$
    a. 5
    b. 3
    c. $5\sqrt{3}$
    d. $3\sqrt{5}$

99. What is the tangent of the angle between the lines y = -2x + 1 and 2y = 2x – 1
    a. -3
    b. -1
    c. 2
    d. 4

100. Find the speed of an aero plane with the position vector $r(t) = t^2i + (t^3 + 1)j + tk$ moving in space at time 3 seconds
    a. 33m/s   c. 35m/s
    b. 32m/s   d. 27m/s