

MTH 103, TMA2.

1. Given that $a = -i + 2j + 2k$, $b = 2i - 4j - 3k$ and $c = 3i - 2j + k$
Find the magnitude of this vector $\hat{A}a + \hat{A}b + \hat{A}c$.

SOLUTION

$$a = -i + 2j + 2k$$

$$b = 2i - 4j - 3k$$

$$c = 3i - 2j + k$$

$$a + b + c = (-1 + 2 + 3)i + (2 - 4 - 2)j + (2 - 3 + 1)k$$

$$a + b + c = 4i - 4j + 0k$$

$$a + b + c = 4i - 4j = 4(i - j)$$

$$a + b + c = 4 (\sqrt{[(1)^2 + (-1)^2]})$$

$$= 4 (\sqrt{2}) = *4\sqrt{2}.*$$

2. Find the equation of the line through the point (6, 5) which is parallel to $3x - 4y = 0$

SOLUTION.

$$3x - 4y = 0$$

$$4y = 3x$$

$$4y = 3x$$

$$y = \frac{3}{4}x, \text{ where } m = \frac{3}{4}$$

$$y = mx + c$$

$$5 = 3/4(6) + C$$

$$C = 5 - 9/2$$

$$C = 10 - 9/2 = 1/2$$

$$y = 3/4x + 1/2$$

$$4y = 3x + 2$$

$$4y - 3x - 2 = 0$$

Final solution: $*3x - 4y + 2 = 0*$.

3. What is the angle between these vectors $A = -2i - 5j + 2k$ and $B = -4i - 2j - 3k$

SOLUTION

$A = -2i - 5j + 2k$ and $B = -4i - 2j - 3k$.

$$A \cdot B = -2(-4) - 5(-2) + 2(-3) = 8 + 10 - 6 = 12$$

$$|a| \cdot |b| = \sqrt{33} \times \sqrt{29}$$

$$\phi = \arccos (12 / \sqrt{33} \times \sqrt{29})$$

$$\phi = 67.175^\circ \approx *67^\circ*.$$

4. Find the magnitude of this vector $a = -i + 2j + 2k$.

SOLUTION

Magnitude, otherwise known as Modulus $= \sqrt{(-1)^2 + 2^2 + 2^2} = \sqrt{1 + 4 + 4} = \sqrt{9} = 3$.

5. Find the centre of the circle with this equation $x^2 + y^2 + 2x - 4y - 15 = 0$

SOLUTION

$$x^2 + y^2 + 2x - 4y - 15 = 0$$

$$x^2 + 2x + y^2 - 4y = 15$$

Using method of completing the squares

$$x^2 + 2x + 2 + y^2 - 4y + 4 = 15 + 2 + 4$$

$$(x + 1)^2 + (y - 2)^2 = 21$$

Comparing the above equation with $(x - a)^2 + (y - b)^2 = r^2$

Hence, centre = $(-1, 2)$

6. Evaluate $i.(j \times k) + j.(i \times k) + k.(i \times j)$.

SOLUTION

This is a dot product of vector. In this case, it's important to note that $i.j = 0$, $i.k = 0$, $j.k = 0$.

Hence, final solution is $k = 1$.

7. Find the value of y in order that the vectors $7\mathbf{i} + y\mathbf{j} + \mathbf{k}$, $3\mathbf{i} + 2\mathbf{j} + \mathbf{k}$, and $5\mathbf{i} + 2\mathbf{j} + \mathbf{k}$ are linearly dependent.

SOLUTION

Please, note that if two or more vectors are linearly dependent, it means that the vectors are dependent ('they depend on one another') if there is some relation among them (in addition to the one with all 0 present for any collection of vectors). So, dependent means there is some relation other than all 0.

So, in this question, we are considering a (3×3) matrix system.

The first vector takes the first rows, and it follows a consequential order.

$$\begin{vmatrix} 7 & y & 1 \\ 3 & 2 & 1 \\ 5 & 3 & 1 \end{vmatrix} = 0$$

$$7(2 - 3) - y(3 - 5) + 1(9 - 10) = 0$$

$$-7 - 2y - 1 = 0$$

$$2y = 7 + 1 = 8$$

$$y = 8/2 = 4$$

Hence, the solution is 4 .

8. Evaluate the eccentricity of a rectangular hyperbola $x^2/a^2 - y^2/a^2 = 1$

SOLUTION

Eccentricity = c / a

$$x^2 / a^2 - y^2 / a^2 = 1$$

Where focal length, $c = \sqrt{a^2 + a^2} = \sqrt{2a^2} = a\sqrt{2}$

$$\text{Eccentricity} = c / a = a\sqrt{2}/a = \sqrt{2} = *1.414*$$

9. Find the vector joining the points P(2, 3, 0) and Q(-1, -2, -4) directed from P to Q.

SOLUTION

P(2, 3, 0) and Q(-1, -2, -4)

$$\vec{PQ} = (-1 - 2)\mathbf{i} + (-2 - 3)\mathbf{j} + (-4 - 0)\mathbf{k}$$

$$\vec{PQ} = *-3\mathbf{i} - 5\mathbf{j} - 4\mathbf{k}*$$

10. The answer to this last question is 24, though from the question, when you work it out thoroughly, you'd get a different answer "42" from the options, but well, NOUN is NOUN. 😊



mth 103



1. distinct real
2. Natural
3. $x+iy$ complex
4. quadratic
5. sum
6. 48
7. complex
8. $6+17i$
9. $-i$
10. -4, -3

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- 1.
2. $M2-M1$ 1 + $M2M1$
3. $-23i+7j+6k$
4. 0
5. gradient
6. $4/5$
- 7.
8. $2v-2$
9. y axis $x = -8/3$ $y = 5/3$
10. $c = 3,6$ $d = 4,8$

6:37 AM

**Great Peters**

Please I need MTH102, BIO101,
GST104 TMA3

6:47 AM

**Adewale Emmanuel**

Please help me CHM191,
MTH103,PHY101. tma3 🙏

8:15 AM

**Mudassir**

Forwarded message

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