

The Chidreva

Computer Engineering

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MAT 102

$$1. \quad A = 2i - j, \quad B = 3i + j - 11k, \quad C = 4i + 4j - 5k$$

$$a. \quad -3A + 7B - 8C$$

$$= -3(2i - j) + 7(3i + j - 11k) - 8(4i + 4j - 5k)$$

$$= -6i + 3j + 21i + 7j - 77k - 32i - 32j + 40k$$

$$= -(7i - 22j - 37k)$$

$$b. \quad K = 2A + 4B - C$$

$$= 2(2i - j) + 4(3i + j - 11k) - (4i + 4j - 5k)$$

$$= 4i - 2j + 12i + 4j - 44k - 4i - 4j + 5k$$

$$= 12i + 6j - 39k$$

$$K = 12i + 6j - 39k$$

$$|K| = \sqrt{(12)^2 + (6)^2 + (-39)^2}$$

$$= \sqrt{144 + 36 + 1521}$$

$$= \sqrt{1701}$$

$$|K| = 41.2$$

$$L = \cos \alpha = 12 / 41.2 = 0.29$$

$$M = \cos \beta = 6 / 41.2 = 0.15$$

$$N = \cos \gamma = \frac{-39}{41.2} = -0.95$$

$$c. \quad A \times (B \times C) + \dots +$$

$$B \times C = \begin{vmatrix} i & j & k \\ 3 & 1 & -11 \\ 4 & 4 & -5 \end{vmatrix}$$

$$= i(1 \times -5) - (4 \times -11) - j(3 \times -5) - (-11 \times 4)$$

$$= i(-5 + 44) - j(15 + 44)$$

$$= [i(39) - j(59) + k(9)]$$

$$A \times (B \times C)$$

$$\begin{array}{r} + \quad - \quad + \\ i \quad j \quad k \\ 2 \quad -1 \quad 0 \\ 39 \quad -29 \quad 9 \end{array} /$$

$$i [(-1 \times 8) - (-29 \times 0)] - j [(2 \times 8) - (39 \times 0)] + k [(2 \times -29) - (39 \times -1)]$$

$$i(-8) - j(16) + k(-19)$$

$$-8i - 16j - 19k$$

d. $(3A \times B) (A \times 2B)$

$$3A \quad -6i - 3j$$

$$3A \times B$$

$$\begin{array}{r} + \quad - \quad + \\ i \quad j \quad k \\ 6 \quad -3 \quad 0 \\ 3 \quad 1 \quad -11 \end{array} /$$

$$i [(-3 \times -11) - (0 \times 1)] - j [(6 \times -11) - (0 \times 3)] + k [(6 \times 9) - (3 \times 3)]$$

$$i [33 - 0] - j [-66 - 0] + k (6 - -9)$$

$$i (33) + j (66) + k (15)$$

$$33i + 66j + 15k$$

$$2B = 6i + 2j - 22k$$

$$A \times 2B$$

$$+ \quad - \quad +$$

$$\begin{array}{r} i \quad j \quad k \\ 2 \quad -1 \quad 0 \\ 6 \quad 2 \quad -22 \end{array} /$$

$$i [(-1 \times 6) - (-1 \times -22)] - j [(-22 \times 2) - (0 \times 6)] + k [(2 \times -1) - (6 \times 2)]$$

$$i (22) - j (-44) + k (10)$$

$$22i + 44j + 10k$$

$$(3A \times B) (A \times 2B)$$

$$(33i + 66j + 15k) \cdot (22i + 44j + 10k)$$

$$726 + 2984 + 150$$

$$3780$$

$$A - 2B - C$$

$$(2i - j) - 2(3i + j - 11k) - (4i + 4j - 5k)$$

$$2i - j - 6i - 2j + 22k - 4i - 4j + 5k$$

$$= -8i - 7j + 27k$$

Perpendicular vectors are two vectors whose dot product is equal to zero e.g. $A \cdot B = 0$

Coplanar vectors is that which when three given vectors A , B and C have the scalar triple product to be equal to zero e.g. $A \cdot (B \times C) = 0$.