

Chapter 2

P.2-1 (a) $\vec{a}_A = \frac{\vec{A}}{A} = \frac{\vec{a}_x + \vec{a}_y 2 - \vec{a}_z 3}{\sqrt{1^2 + 2^2 + (-3)^2}} = \frac{1}{\sqrt{14}} (\vec{a}_x + \vec{a}_y 2 - \vec{a}_z 3)$

(b) $|\vec{A} - \vec{B}| = |\vec{a}_x + \vec{a}_y 6 - \vec{a}_z 4| = \sqrt{1^2 + 6^2 + 4^2} = \sqrt{53}$

(c) $\vec{A} \cdot \vec{B} = 0 + 2(-4) + (-3) = -11$

(d) $\theta_{AB} = \cos^{-1}(\vec{A} \cdot \vec{B} / AB) = \cos^{-1}(-11 / \sqrt{14} \sqrt{17}) = 135.5^\circ$

(e) $\vec{A} \cdot \vec{a}_C = \vec{A} \cdot \frac{\vec{C}}{C} = \vec{A} \cdot \frac{1}{\sqrt{29}} (\vec{a}_x 5 - \vec{a}_z 2) = \frac{11}{\sqrt{29}}$

(f) $\vec{A} \times \vec{C} = -\vec{a}_x 4 - \vec{a}_y 13 - \vec{a}_z 10$

(g) $\vec{A} \cdot (\vec{B} \times \vec{C}) = (\vec{A} \times \vec{B}) \cdot \vec{C} = -42$

(h) $(\vec{A} \times \vec{B}) \times \vec{C} = \vec{B}(\vec{A} \cdot \vec{C}) - \vec{A}(\vec{C} \cdot \vec{B}) = \vec{a}_x 2 - \vec{a}_y 40 + \vec{a}_z 5$
 $\vec{A} \times (\vec{B} \times \vec{C}) = \vec{B}(\vec{A} \cdot \vec{C}) - \vec{C}(\vec{A} \cdot \vec{B}) = \vec{a}_x 33 + \vec{a}_y 44 - \vec{a}_z 11$

P.2-2 Position vectors of the three corners:

$\vec{OP}_1 = \vec{a}_y - \vec{a}_x 2$, $\vec{OP}_2 = \vec{a}_x 4 - \vec{a}_y - \vec{a}_z 3$, $\vec{OP}_3 = \vec{a}_x 6 + \vec{a}_y 2 + \vec{a}_z 5$

Vectors representing the three sides of the triangle:

$\vec{P}_1\vec{P}_2 = \vec{OP}_2 - \vec{OP}_1 = \vec{a}_x 4 - \vec{a}_z$, $\vec{P}_2\vec{P}_3 = \vec{a}_x 2 + \vec{a}_y + \vec{a}_z 8$, $\vec{P}_3\vec{P}_1 = -\vec{a}_x 6 - \vec{a}_y - \vec{a}_z$

(a) $\vec{P}_1\vec{P}_2 \cdot \vec{P}_2\vec{P}_3 = 0$. $\therefore \Delta P_1 P_2 P_3$ is a right triangle.

(b) Area of triangle = $\frac{1}{2} |\vec{P}_1\vec{P}_2 \times \vec{P}_2\vec{P}_3| = 17.1$

P.2-3



$\vec{D}_1 = \vec{B} + \vec{A}$, $\vec{D}_2 = \vec{B} - \vec{A}$

$\vec{D}_1 \cdot \vec{D}_2 = (\vec{B} + \vec{A}) \cdot (\vec{B} - \vec{A})$
 $= \vec{B} \cdot \vec{B} - \vec{A} \cdot \vec{A} = 0$

$\therefore \vec{D}_1 \perp \vec{D}_2$

P.2-4 From $\vec{A} \cdot \vec{B} = \vec{A} \cdot \vec{C}$, we have $\vec{A} \cdot (\vec{B} - \vec{C}) = 0$. (1)

From $\vec{A} \times \vec{B} = \vec{A} \times \vec{C}$, we have $\vec{A} \times (\vec{B} - \vec{C}) = 0$. (2)

(1) implies $\vec{A} \perp (\vec{B} - \vec{C})$ and (2) implies $\vec{A} \parallel (\vec{B} - \vec{C})$. Since $\vec{A}$ is not a null vector, (1) and (2) cannot hold at the same time unless $(\vec{B} - \vec{C})$ is a null vector. Thus, $\vec{B} - \vec{C} = 0$ or $\vec{B} = \vec{C}$.

P.2-5 $\vec{a}_A \cdot \vec{a}_B = \cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$.

Field And Wave Electromagnetics Solution Manual

E Durkheim



Field And Wave Electromagnetics Solution Manual:

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Manual for Field and Wave Electromagnetics David K. Cheng, 1983 **Finite Elements for Wave Electromagnetics** IEEE Antennas and Propagation Society, 1994 [The Multilevel Fast Multipole Algorithm \(MLFMA\) for Solving Large-Scale Computational Electromagnetics Problems](#) Ozgur Ergul, Levent Gurel, 2014-06-23 The Multilevel Fast Multipole Algorithm MLFMA for Solving Large Scale Computational Electromagnetic Problems provides a detailed and instructional overview of implementing MLFMA The book Presents a comprehensive treatment of the MLFMA algorithm including basic linear algebra concepts recent developments on the parallel computation and a number of application examples Covers solutions of electromagnetic problems involving dielectric objects and perfectly conducting objects Discusses applications including scattering from airborne targets scattering from red blood cells radiation from antennas and arrays metamaterials etc Is written by authors who have more than 25 years experience on the development and implementation of MLFMA The book will be useful for post graduate students researchers and academics studying in the areas of computational electromagnetics

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