

# Fundamentals of Electromagnetics with Engineering Applications 1st Edition Wentworth Solutions Manual

## Solutions for Chapter 2 Problems

### 1. Vectors in the Cartesian Coordinate System

P2.1: Given  $P(4,2,1)$  and  $\mathbf{A}_{PQ}=2\mathbf{a}_x+4\mathbf{a}_y+6\mathbf{a}_z$ , find the point Q.

$$\mathbf{A}_{PQ} = 2 \mathbf{a}_x + 4 \mathbf{a}_y + 6 \mathbf{a}_z = (Q_x - P_x)\mathbf{a}_x + (Q_y - P_y)\mathbf{a}_y + (Q_z - P_z)\mathbf{a}_z$$

$$Q_x - P_x = Q_x - 4 = 2; \quad Q_x = 6$$

$$Q_y - P_y = Q_y - 2 = 4; \quad Q_y = 6$$

$$Q_z - P_z = Q_z - 1 = 6; \quad Q_z = 7$$

Ans:  $Q(6,6,7)$

P2.2: Given the points  $P(4,1,0)\text{m}$  and  $Q(1,3,0)\text{m}$ , fill in the table and make a sketch of the vectors found in (a) through (f).

|                                                  | Vector                                                       | Mag  | Unit Vector                                                |
|--------------------------------------------------|--------------------------------------------------------------|------|------------------------------------------------------------|
| a. Find the vector <b>A</b> from the origin to P | $\mathbf{A}_{OP} = 4 \mathbf{a}_x + 1 \mathbf{a}_y$          | 4.12 | $\mathbf{a}_{OP} = 0.97 \mathbf{a}_x + 0.24 \mathbf{a}_y$  |
| b. Find the vector <b>B</b> from the origin to Q | $\mathbf{B}_{OQ} = 1 \mathbf{a}_x + 3 \mathbf{a}_y$          | 3.16 | $\mathbf{a}_{OQ} = 0.32 \mathbf{a}_x + 0.95 \mathbf{a}_y$  |
| c. Find the vector <b>C</b> from P to Q          | $\mathbf{C}_{PQ} = -3 \mathbf{a}_x + 2 \mathbf{a}_y$         | 3.61 | $\mathbf{a}_{PQ} = -0.83 \mathbf{a}_x + 0.55 \mathbf{a}_y$ |
| d. Find <b>A + B</b>                             | $\mathbf{A} + \mathbf{B} = 5 \mathbf{a}_x + 4 \mathbf{a}_y$  | 6.4  | $\mathbf{a} = 0.78 \mathbf{a}_x + 0.62 \mathbf{a}_y$       |
| e. Find <b>C - A</b>                             | $\mathbf{C} - \mathbf{A} = -7 \mathbf{a}_x + 1 \mathbf{a}_y$ | 7.07 | $\mathbf{a} = -0.99 \mathbf{a}_x + 0.14 \mathbf{a}_y$      |
| f. Find <b>B - A</b>                             | $\mathbf{B} - \mathbf{A} = -3 \mathbf{a}_x + 2 \mathbf{a}_y$ | 3.6  | $\mathbf{a} = -0.83 \mathbf{a}_x + 0.55 \mathbf{a}_y$      |

a.  $\mathbf{A}_{OP} = (4-0)\mathbf{a}_x + (1-0)\mathbf{a}_y + (0-0)\mathbf{a}_z = 4 \mathbf{a}_x + 1 \mathbf{a}_y$ .

$$|\mathbf{A}_{OP}| = \sqrt{4^2 + 1^2} = \sqrt{17} = 4.12$$

$$\mathbf{a}_{OP} = \frac{4}{\sqrt{17}} \mathbf{a}_x + \frac{1}{\sqrt{17}} \mathbf{a}_y = 0.97 \mathbf{a}_x + 0.24 \mathbf{a}_y$$

(see Figure P2.2ab)

b.  $\mathbf{B}_{OQ} = (1-0)\mathbf{a}_x + (3-0)\mathbf{a}_y + (0-0)\mathbf{a}_z = 1 \mathbf{a}_x + 3 \mathbf{a}_y$ .

$$|\mathbf{B}_{OQ}| = \sqrt{1^2 + 3^2} = \sqrt{10} = 3.16$$

$$\mathbf{a}_{OQ} = \frac{1}{\sqrt{10}} \mathbf{a}_x + \frac{3}{\sqrt{10}} \mathbf{a}_y = 0.32 \mathbf{a}_x + 0.95 \mathbf{a}_y$$

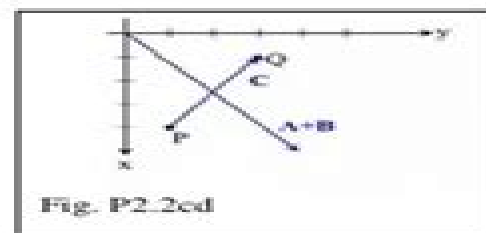
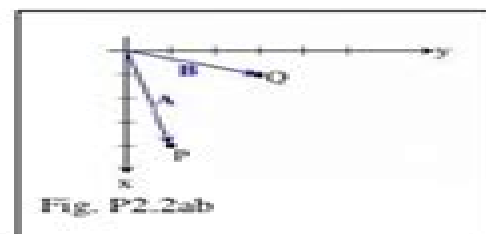
(see Figure P2.2ab)

c.  $\mathbf{C}_{PQ} = (1-4)\mathbf{a}_x + (3-1)\mathbf{a}_y + (0-0)\mathbf{a}_z = -3 \mathbf{a}_x + 2 \mathbf{a}_y$ .

$$|\mathbf{C}_{PQ}| = \sqrt{3^2 + 2^2} = \sqrt{13} = 3.61$$

$$\mathbf{a}_{PQ} = \frac{-3}{\sqrt{13}} \mathbf{a}_x + \frac{2}{\sqrt{13}} \mathbf{a}_y = -0.83 \mathbf{a}_x + 0.55 \mathbf{a}_y$$

(see Figure P2.2cd)



# **Solution Manual For Electromagnetics By Kraus**

**Franklin Institute (Philadelphia, Pa.)**



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*Electromagnetics* John D. Kraus, Keith R. Carver, 1973      **Books in Print** ,1991      Catalog of Copyright Entries. Third Series Library of Congress. Copyright Office, 1954 Includes Part 1A Number 1 Books January June and Part 1B Number 1 Pamphlets Serials and Contributions to Periodicals January June      **Catalogue for the Academic Year** Naval Postgraduate School (U.S.), 1958      **Books in Print Supplement** ,1985      *Integral Equation Techniques in Transient Electromagnetics* Dragan Poljak, C. Y. Tham, 2003 Transient electromagnetic phenomena can be treated in two ways either using direct time domain modeling or frequency domain analysis applying the inverse Fourier transform Both approaches are important since each has distinct advantages depending on the situation or the application      **Subject Guide to Books in Print** ,1971

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**Proceedings of the IRE.** ,1955      **Books and Pamphlets, Including Serials and Contributions to Periodicals** Library of Congress. Copyright Office, 1954      *Proceedings of the IRE.* Institute of Radio Engineers, 1955      **The Influence of Water Content in Hydrated Superabsorbent Polymer on Dielectric Properties, Antenna Radiated Power, and RFID Tag Readability** Xuebing Zhang, 2006      **Catalog of Copyright Entries** Library of Congress. Copyright Office, 1953

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