

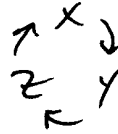
1.3 If $\mathbf{A} = 4\mathbf{a}_x - 2\mathbf{a}_y + 6\mathbf{a}_z$ and $\mathbf{B} = 12\mathbf{a}_x + 18\mathbf{a}_y - 8\mathbf{a}_z$, determine:

(a) $\mathbf{A} - 3\mathbf{B}$

(b) $(2\mathbf{A} + 5\mathbf{B})/|\mathbf{B}|$

(c) $\mathbf{a}_x \times \mathbf{A}$

(d) $(\mathbf{B} \times \mathbf{a}_x) \cdot \mathbf{a}_y$



a) $\mathbf{A} - 3\mathbf{B} = (4\hat{\mathbf{a}}_x - 2\hat{\mathbf{a}}_y + 6\hat{\mathbf{a}}_z) - (36\hat{\mathbf{a}}_x + 54\hat{\mathbf{a}}_y - 24\hat{\mathbf{a}}_z)$

$$\underline{\underline{\mathbf{A} - 3\mathbf{B} = -32\hat{\mathbf{a}}_x - 56\hat{\mathbf{a}}_y + 30\hat{\mathbf{a}}_z}}$$

b) First, find $2\mathbf{A} + 5\mathbf{B} = [2(4) + 5(12)]\hat{\mathbf{a}}_x + [2(-2) + 5(18)]\hat{\mathbf{a}}_y + [2(6) + 5(-8)]\hat{\mathbf{a}}_z$
 $= 68\hat{\mathbf{a}}_x + 86\hat{\mathbf{a}}_y - 28\hat{\mathbf{a}}_z$

Second, find $|\mathbf{B}| = \sqrt{\mathbf{B} \cdot \mathbf{B}} = \sqrt{12^2 + 18^2 + (-8)^2} = \sqrt{532}$

Finally, $\frac{(2\mathbf{A} + 5\mathbf{B})}{|\mathbf{B}|} = \frac{68\hat{\mathbf{a}}_x + 86\hat{\mathbf{a}}_y - 28\hat{\mathbf{a}}_z}{\sqrt{532}} = \underline{\underline{2.948\hat{\mathbf{a}}_x + 3.729\hat{\mathbf{a}}_y - 1.214\hat{\mathbf{a}}_z}}$

c) $\hat{\mathbf{a}}_x \times \mathbf{A} = \hat{\mathbf{a}}_x \times (4\hat{\mathbf{a}}_x - 2\hat{\mathbf{a}}_y + 6\hat{\mathbf{a}}_z) = 0 - 2\hat{\mathbf{a}}_z - 6\hat{\mathbf{a}}_y$

$$\underline{\underline{\hat{\mathbf{a}}_x \times \mathbf{A} = -6\hat{\mathbf{a}}_y - 2\hat{\mathbf{a}}_z}}$$

d) First, find $\mathbf{B} \times \hat{\mathbf{a}}_x = (12\hat{\mathbf{a}}_x + 18\hat{\mathbf{a}}_y - 8\hat{\mathbf{a}}_z) \times \hat{\mathbf{a}}_x$
 $= 0 - 18\hat{\mathbf{a}}_z - 8\hat{\mathbf{a}}_y = -8\hat{\mathbf{a}}_y - 18\hat{\mathbf{a}}_z$

Now, find $(\mathbf{B} \times \hat{\mathbf{a}}_x) \cdot \hat{\mathbf{a}}_y = (-8\hat{\mathbf{a}}_y - 18\hat{\mathbf{a}}_z) \cdot \hat{\mathbf{a}}_y = -8 + 0$

$$\underline{\underline{(\mathbf{B} \times \hat{\mathbf{a}}_x) \cdot \hat{\mathbf{a}}_y = -8}}$$