Chapter 9 Vector Differential Calculus. Grad, Div, Curl

P360 - Problem set 9.1

Problem 1-5

PS 9.1

1–5 COMPONENTS AND LENGTH

Find the components of the vector **v** with initial point P and terminal point Q. Find $|\mathbf{v}|$. Sketch $|\mathbf{v}|$. Find the unit vector **u** in the direction of **v**.

1. P: (1, 1, 0), Q: (6, 2, 0)
2. P: (1, 1, 1), Q: (2, 2, 0)
3. P: (−3.0, 4,0, −0.5), Q: (5.5, 0, 1.2)
4. P: (1, 4, 2), Q: (−1, −4, −2)
5. P: (0, 0, 0), Q: (2, 1, −2)

1. $\vec{v} = [5, 1, 0]$

$|v| = \sqrt{26}$

$\vec{u} = \left[\frac{5\sqrt{26}}{26}, \frac{\sqrt{26}}{26}, 0\right]$

2. $\vec{v} = [1, 1, -1]$

$|v| = \sqrt{3}$

$\vec{u} = \left[\frac{\sqrt{3}}{3}, \frac{\sqrt{3}}{3}, -\frac{\sqrt{3}}{3}\right]$

3. $\vec{v} = [8.5, -4, 1.7]$

$|v| = \sqrt{72.25 + 16 + 2.89}$

$= \sqrt{91.14}$

$\vec{u} = \left[\frac{8.5}{\sqrt{91.14}}, \frac{-4}{\sqrt{91.14}}, \frac{1.7}{\sqrt{91.14}}\right]$

4) $\vec{v} = [-2, -8, -4]$

$|v| = \sqrt{4 + 64 + 16}$

$= \sqrt{84}$

$\vec{u} = \left[-\frac{1}{\sqrt{21}}, -\frac{4}{\sqrt{21}}, -\frac{2}{\sqrt{21}}\right]$

5) $\vec{v} = [2, 1, -2]$

$|v| = \sqrt{4 + 1 + 4} = 3$

$\vec{u} = \left[\frac{2}{3}, \frac{1}{3}, -\frac{2}{3}\right]$

6. Q=[4, 2, 13], |v|=4
7. Q=[4, 0. 1/2], |v|=$\sqrt{149}/4$
8. Q=[13.1, 0.8, -2.0], |v|=$\sqrt{171.61 + 0.64 + 4}$=$\sqrt{176.25}$

9. Q=[0, 0, 0], |v|=$\sqrt{53}$
10. Q=[0, 0, 0], |v|=$3\sqrt{2}$
11. 2a=[6, 4, 0], 1/2a=[3/2, 1, 0], -a = [-3, -2, 0]
12. (a+b)+c=a+(b+c)=[4, 7, 8] *b is not consistant.*
13. b+c=c+b = [1, 5, 8]
14. 3c-6d=3(c-2d)=[15, -3, 0]
15. 7(c-b)=7c-7b=7*[9, -7, 8]=[63, -49, 56]
16. $\frac{9}{2}a - 3c$=$9(\frac{1}{2}a - \frac{1}{3}c)$=[-3/2, 12, -24]
17. (7-3)a=7a-3a=4a=[12, 8, 0]
18. 4a+3b = [0, 26, 0], -4a-3b=-(4a+3b)=[0, -26, 0]
19. 12-associative, 13-commutative, 14-16 scalar multiplication is distributive.
20. $a + b = [a_1, a_2, ..., a_n] + [b_1, b_2, ..., b_n] = [a_1 + b_1, a_2 + b_2, ..., a_n + b_n] = [b_1 + a_1, b_2 + a_2, ..., b_n + a_n] = b + a$
    The rest can be approved in the simliar way.
21.