Math Analysis Honors Worksheet #4

1. If $\vec{u} = (-4,5)$ and $\vec{v} = (4,0)$, find $2\vec{u} - \vec{v}$

2. If $\vec{u} = (6,5), \vec{v} = (-7,2)$ and $\vec{t} = (-3,-5)$, find $3\vec{u} + 3(\vec{t} - \vec{v})$

3. If $P = (1,3,-4)$ and $Q = (7,10,2)$, find the midpoint of PQ

4. If $P = (1,3,-4)$ and $Q = (7,10,2)$, find PQ

5. If $A = (0,0,12)$, $B = (3,4,0)$ and $C = (-4,3,0)$, is $\triangle ABC$ isosceles, scalene or equilateral? Why?

6. If $\vec{u} = (3,4)$ and $\vec{w} = (1,1)$, then find the **norm** of $3\vec{w} + \vec{u}$

7. Are the following vectors orthogonal? (3,4,1) and (4,-2,-4)

8. Find the measure of the angle between (-3, 3, 6) and (4, 2, 1) to the nearest tenth.

9. Find k so that the given vectors are perpendicular: (5,8) and (-2,-k)

10. Write the vector (6,-3) as a linear combination of $\vec{i}$ and $\vec{j}$.

11. Write $\vec{t} = (-18,-9)$ as a linear combination of $\vec{u} = (1,-2)$ and $\vec{v} = (6,3)$

12. Write $\vec{t} = (-3,1)$ as a linear combination of $\vec{u} = (-1,5)$ and $\vec{v} = (5,1)$

13. Write $\vec{t} = (1,9)$ as a linear combination of $\vec{u} = (1,3)$ and $\vec{v} = (2,-3)$

14. Find a vector with norm 10 and in the opposite direction of $\vec{u} = (-2,5)$

15. Find the vector with same magnitude as $\vec{u} = (-2,5)$ but in the opposite direction of $\vec{u}$

For each of the following let $\vec{u} = (-8,6), \vec{v} = (5,12), \vec{s} = (3,-4), \vec{w} = (1,3,5), \vec{t} = (-2,1,-4)$

16. Find $\| \vec{w} \|$

17. Find $2\vec{u}$

18. Find $3\vec{u} - 2\vec{v}$

19. Find $\| \vec{u} \|$

20. Find $\| \vec{v} \|$

21. Find $\dfrac{7\vec{u}}{\| \vec{u} \|}$

22. $\vec{w} \bullet \vec{t}$

23. $\vec{u} \bullet \vec{v}$

24. Are $\vec{u}$ and $\vec{s}$ orthogonal? Why or why not?

25. Find the measure of the angle between $\vec{s}$ and $\vec{v}$ to the nearest tenth.

26. Find $\vec{w} \times \vec{t}$

27. Find the area of the parallelogram with sides $\vec{w}$ and $\vec{t}$

28. An airplane takes off on a bearing of $80°$ and airspeed of **350** mph. A north wind is blowing at 35 mph. Find the groundspeed and true course of the plane.
(345.64 on a bearing of 85.72°)

29. Two forces act on the same point. One is force of 30 N at $45°$. The other is a force of 40 N at $120°$. Find the magnitude and direction of the resultant force. **(55.86 N @ 88.76°)**

30. Three forces of 114 lbs, and 210 lbs are in equilibrium. Find the measure of the angle between the 114 lb force and the 120 lb. force. **(52.4°)**

31. A pilot wants his groundspeed to be 260 mph on a bearing of $180°$. An east wind is blowing at 65 mph. What should his airspeed and heading be so that the wind will blow him back onto his intended course? **(268 mph on a bearing of 165.96°)**

32. Find the volume of the parallelepiped whose edges are
$\vec{u} = (-3,2,6), \vec{v} = (4,-1,5), \text{ and } \vec{w} = (-2,2,7)$. **(Answer = 11)**

33. Points A(2,5,6), B(5,-2,1) and C(8,2,6) are given. Find a vector perpendicular to the plane ABC going through point A. **(-15,-30,33) or any scalar multiple of this vector**

34. Find the area of the parallelogram whose consecutive sides are the vectors (-5,7,2) and (3,4,1) **(43.43)**

35. Find the angle between the vectors (-4,5,6) and (1,-2,1). **(111.85°)**

1. (-12,10) 2. (30,-6) 3. $(4, \frac{13}{2}, -1)$ 4.11 5. isosceles 6. $\sqrt{85}$ 7. orthogonal 8. 90 9. $\frac{-5}{4}$ 10. 6i-3j 11. t = -3v 12. $t = \frac{4}{13}u - \frac{7}{13}v$ 13. $t = \frac{7}{3}u - \frac{2}{3}v$ 14. $(\frac{20\sqrt{29}}{29}, \frac{-50\sqrt{29}}{29})$ 15. (2,-5) 16. $\sqrt{35}$ 17. (-16,12) 18. (-34,-6) 19. 10 20. 26 21. $(\frac{-28}{5}, \frac{21}{5})$ 22. -19 23. 32 24. -48 25. $120.5°$ 26. (-17,-6,7) 27. $\sqrt{374}$