

**Math Analysis Honors  
Vector Worksheet #5**

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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  $\vec{u}$
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**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  $3\vec{u} - 2\vec{v}$
  22.  $\vec{w} \bullet \vec{t}$
  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  $80^\circ$  and airspeed of 350 mph. A north wind is blowing at 35 mph. Find the groundspeed and true course of the plane.
  29. Two forces act on the same point. One is force of 30 N at  $45^\circ$ . The other is a force of 40 N at  $120^\circ$ . Find the magnitude and direction of the resultant force.
  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.
  31. A pilot wants his groundspeed to be 260 mph on a bearing of  $180^\circ$ . 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?
  32. Find the volume of the parallelepiped whose edges are  $\vec{u} = (-3, 2, 6)$ ,  $\vec{v} = (4, -1, 5)$ , and  $\vec{w} = (-2, 2, 7)$ .
  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.
  34. Find the area of the parallelogram whose consecutive sides are the vectors  $(-5, 7, 2)$  and  $(3, 4, 1)$
  35. Find the angle between the vectors  $(-4, 5, 6)$  and  $(1, -2, 1)$ .
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**Answers:**

1. (-12,10)	2. (30,-6)	3. $\left(4, \frac{13}{2}, -1\right)$	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. $\left(\frac{20\sqrt{29}}{29}, \frac{-50\sqrt{29}}{29}\right)$	15. (2,-5)	16. $\sqrt{35}$
17. (-16,12)	18. (-34,-6)	19. 10	20. 13
21. $\left(\frac{-28}{5}, \frac{21}{5}\right)$	22. -19	23. 32	24. -48
25. $120.5^\circ$	26. (-17,-6,7)	27. $\sqrt{374}$	28. 345.64 @ $85.72^\circ$
29. 55.86N @ $88.76^\circ$	30. $52.4^\circ$	31. 268 mph @ $165.96^\circ$	32. 11
33. (-15,-30, 33) (or any scalar multiple of this vector)	34. 42.46	35. $111.85^\circ$	