Name: Key Date: Hour:

PRECALCULUS VECTORS

Find the component form of $\overrightarrow{AB}$. Then find the magnitude of $\overrightarrow{AB}$.

1. $A\ (2,4),\ B\ (-1,3)$

$\langle -3,-1\rangle$

$|\vec{AB}|^2 = (-3)^2 + (-1)^2$

$|\vec{AB}| = \sqrt{10}$

2. $A\ (4,-2),\ B\ (5,-5)$

$\langle 1,-3\rangle$

$|\vec{AB}| = \sqrt{10}$

Let $\vec{v} = \langle 2,-1\rangle$ *and* $\vec{w} = \langle -3,5\rangle$. Find $\vec{u}$ algebraically.

3. $\vec{u} = \vec{w} - 2\vec{v}$

$\langle -3,5\rangle - \langle 4,-2\rangle$

$\langle -7,7\rangle$

4. $\vec{u} = 2\vec{v} + 3\vec{w}$

$\langle 4,-2\rangle + \langle -9,15\rangle$

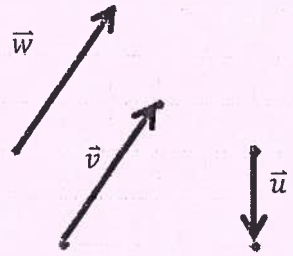
$\langle -5,13\rangle$

5. $\vec{u} = 5\vec{w} - 2\vec{v}$

$\langle -15,25\rangle - \langle 4,-2\rangle$

$\langle -19,27\rangle$

Use the vectors in the figure below to graph each of the following vectors.



6. $\vec{v} + \vec{w}$

$\langle 4,6\rangle$

7. $3\vec{v} + (-2)\vec{u}$

$\langle 6,13\rangle$

8. $2\vec{u} - \vec{v} + 2\vec{w}$

$\langle 2,-1\rangle$

Find a unit vector for each vector.

9. $\vec{v} = \langle -3, 4 \rangle$

$|\vec{v}| = 5$

$\langle -\frac{3}{5}, \frac{4}{5} \rangle$

10. $\vec{v} = \langle 1, 5 \rangle$

$|\vec{v}| = \sqrt{26}$

$\langle \frac{1}{\sqrt{26}}, \frac{5}{\sqrt{26}} \rangle$

Find the vector $\vec{v}$ with the given magnitude and the same direction as $\vec{u}$.

11. $\|\vec{v}\| = 3, \vec{u} = \langle 3, -4 \rangle$

12. $\|\vec{v}\| = 2, \vec{u} = \langle -5, 7 \rangle$

Find the direction angle of each vector.

13. $\vec{u} = 2\vec{\imath} - 5\vec{j}$

$\theta = \tan^{-1}\left(\frac{-5}{2}\right)$

$= -68.20° + 360°$

Quadrant IV → 291.80°

14. $\vec{u} = -3\vec{\imath} - 7\vec{j}$

$\theta = \tan^{-1}\left(\frac{-7}{-3}\right)$

$= 66.80° + 180°$

Quadrant III → 246.80°

Find the component form of each vector.

15. $\|\vec{u}\| = 20$, angle = 150°

$x = 20 \cos(150)$

$y = 20 \sin(150)$

$\langle -17.32, 10 \rangle$

16. $\|\vec{u}\| = 10$, angle = 315°

$x = 10 \cos(315)$

$y = 10 \sin(315)$

$\langle 7.07, -7.07 \rangle$

Find $\vec{v} \cdot \vec{w}$. (Dot Product)

17. $\vec{v} = 5\vec{\imath} - 2\vec{j}, \quad \vec{w} = -3\vec{\imath} + \vec{j}$

$\vec{v} \cdot \vec{w} = 5(-3) - 2(1)$

$-15 - 2$

$= -17$

18. $\vec{v} = 3\vec{\imath} - 9\vec{j}, \quad \vec{w} = 2\vec{\imath} + \vec{j}$

$3(2) - 9(1)$

$6 - 9$

$= -3$

Find the angle between $\vec{v}$ and $\vec{w}$.

$$\cos(\theta) = \frac{u \cdot v}{|u| \cdot |v|}$$

19. $\vec{v} = 3\vec{\imath} + 2\vec{j}, \quad \vec{w} = 7\vec{\imath} - 5\vec{j}$

$|v| = \sqrt{13}$

$|w| = \sqrt{74}$

$\cos\theta = \frac{3(7)+2(-5)}{\sqrt{13}\cdot\sqrt{74}}$

$\theta = 69.23°$

20. $\vec{v} = 2\vec{\imath} + 3\vec{j}, \quad \vec{w} = 7\vec{\imath} - \vec{j}$

$|v| = \sqrt{13}$

$|w| = 5\sqrt{2}$

$\cos\theta = \frac{2(7)+3(-1)}{\sqrt{13}\cdot 5\sqrt{2}}$

$\theta = 64.44°$

21. Which pairs of vectors are orthogonal?

a. $\vec{v} = \langle 3, -2\rangle, \quad \vec{w} = \langle -1, 2\rangle$

(b.) $\vec{v} = \langle -2, 0\rangle, \quad \vec{w} = \langle 0, 5\rangle$

c. $\vec{v} = \langle -1, 2\rangle, \quad \vec{w} = \langle 0, -\frac{1}{2}\rangle$

d. $\vec{v} = \langle 2, -3\rangle, \quad \vec{w} = \langle -2, 3\rangle$

If dot product = 0, then $\perp$.

22. Find k so that $\vec{u}$ and $\vec{v}$ are orthogonal.

$$\vec{u} = 3\vec{\imath} + 2\vec{j}, \quad \vec{v} = 2\vec{\imath} - k\vec{j}$$

$3(2) + 2(-k) = 0$

$6 - 2k = 0$

$-2k = -6$

$k = 3$