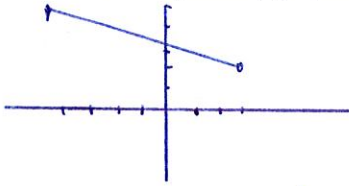


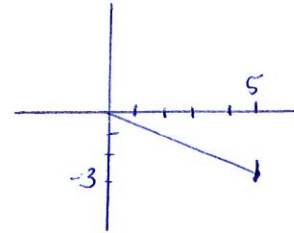
Precalculus Worksheet: Introduction to Vectors

Part I: Sketch the following vectors.

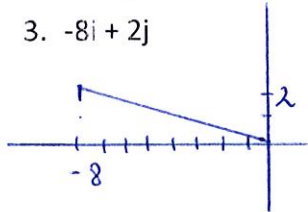
1. Initial point (3, 2) and terminal point (-4, 5)



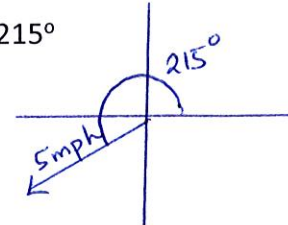
2. $\langle 5, -3 \rangle$



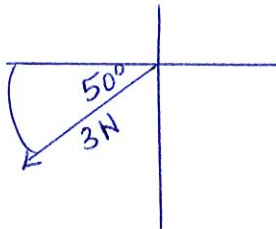
3. $-8i + 2j$



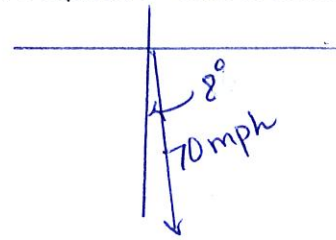
4. 5 mph at 215°



5. 3N at 50° south of west



6. 70 mph at 8° east of south



Part II: Find the a) component form b) linear combination form, c) magnitude and direction of each vector given the initial point and terminal point, respectively.

6. (1, 11) and (9, 3)

a. $\langle 8, -8 \rangle$ Q4

b. $8i - 8j$

c. $\sqrt{8^2 + 8^2} \approx 8\sqrt{2} \approx 11.3$

d. $\tan^{-1}\left(\frac{-8}{8}\right) = \frac{-45^\circ + 360^\circ}{315^\circ}$

7. (-3, 4) and (5, -1) Q4

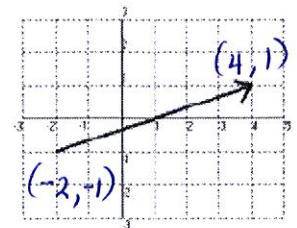
a. $\langle 8, -5 \rangle$

b. $8i - 5j$

c. $\sqrt{8^2 + 5^2} = \sqrt{89} \approx 9.4$

d. $\tan^{-1}\left(\frac{-5}{8}\right) \approx \frac{-32.0^\circ + 360^\circ}{328^\circ}$

8.



Q1

a. $\langle 6, 2 \rangle$

b. $6i + 2j$

c. $\sqrt{6^2 + 2^2} = \sqrt{40} = 2\sqrt{10} \approx 6.3$

d. $\tan^{-1}\left(\frac{2}{6}\right) \approx 18.4^\circ$

Part III: Find the resultant vector

9. $u = \langle 3, 1 \rangle, v = \langle -2, 4 \rangle$

Find $u - 3v$

$\langle 3, 1 \rangle - 3\langle -2, 4 \rangle$

$\langle 3, 1 \rangle + \langle 6, -12 \rangle$

$\langle 9, -11 \rangle$

10. $u = \langle -1, -3 \rangle, v = \langle 2, 0 \rangle$

Find $2u + v$

$2\langle -1, -3 \rangle + \langle 2, 0 \rangle$

$\langle -2, -6 \rangle + \langle 2, 0 \rangle$

$\langle 0, -6 \rangle$

11. $u = 2i + j, v = 3i - 4j$

Find $v - 4u$

$(3i - 4j) - 4(2i + j)$

$3i - 4j - 8i - 4j$

$-5i - 8j$

Given $u = \langle -3, 8 \rangle$, $v = \langle 6, -2 \rangle$, and $w = \langle -4, -3 \rangle$, Find the following. Write answers in component form and linear combination form if the answer is a vector.

14. $3 - \|w\|$ ← magnitude of w

$$\|w\| = \sqrt{4^2 + 3^2} = \sqrt{16+9} = \sqrt{25} = 5$$

$$\boxed{\begin{matrix} 3-5 \\ -2 \end{matrix}}$$

15. $u+v$ $\langle -3, 8 \rangle + \langle 6, -2 \rangle$

$$\boxed{\langle 3, 6 \rangle}$$

16. $3v$

$$3 \langle 6, -2 \rangle$$

$$\boxed{\langle 18, -6 \rangle}$$

Rationalized

$$\boxed{\langle \frac{\sqrt{5}}{5}, \frac{2\sqrt{5}}{5} \rangle}$$

17. $6w - \frac{1}{2}v + u$

$$6\langle -4, -3 \rangle - \frac{1}{2}\langle 6, -2 \rangle + \langle -3, 8 \rangle$$

$$\langle -24, -18 \rangle + \langle -3, 1 \rangle + \langle -3, 8 \rangle$$

$$\boxed{\langle -30, -9 \rangle}$$

18. $\|2u+v\|$

← find magnitude fast

$$2\langle -3, 8 \rangle + \langle 6, -2 \rangle$$

$$\langle -6, 16 \rangle + \langle 6, -2 \rangle$$

$$\langle 0, 14 \rangle$$

$$\sqrt{0^2 + 14^2}$$

$$\sqrt{196} = \boxed{14}$$

19. $\frac{u+v}{\|u+v\|}$ $\frac{\sqrt{3^2+6^2}}{\sqrt{9+36}}$

$$u+v = \langle -3, 8 \rangle + \langle 6, -2 \rangle$$

$$\langle 3, 6 \rangle$$

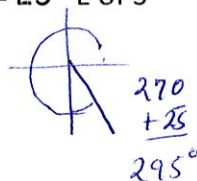
$$\langle \frac{3}{\sqrt{45}}, \frac{6}{\sqrt{45}} \rangle$$

20. $\|u\| = 14$ $\theta = 25^\circ$

$$\langle 14 \cos 25^\circ, 14 \sin 25^\circ \rangle$$

$$\boxed{\langle 12.7, 5.9 \rangle}$$

21. $\|v\| = 298$ $\theta = 25^\circ$ E of S



$$\langle 298 \cos 295^\circ, 298 \sin 295^\circ \rangle$$

$$\boxed{\langle 125.9, -270.1 \rangle}$$

22. $\|u\| = 39$ $\theta = 215^\circ$

$$\langle 39 \cos 215^\circ, 39 \sin 215^\circ \rangle$$

$$\boxed{\langle -31.9, -22.4 \rangle}$$

Find the magnitude and direction of the vector.

23. $\langle 14, -18 \rangle$ Q4

$$\sqrt{14^2 + 18^2} = 2\sqrt{130}$$

$$\approx 22.8$$

$$\tan^{-1}\left(\frac{-18}{14}\right) \approx -52.1^\circ$$

$$+ 360^\circ$$

$$\underline{\hspace{2cm}}$$

$$307.9^\circ$$

24. $-7i + 9j$ Q2

$$\sqrt{7^2 + 9^2}$$

$$\sqrt{130} \approx 11.4$$

$$\tan^{-1}\left(\frac{9}{-7}\right)$$

$$\approx -52.1^\circ$$

$$+ 180^\circ$$

$$\underline{\hspace{2cm}}$$

$$127.9^\circ$$

25. $\langle -18, -25 \rangle$ Q3

$$\sqrt{18^2 + 25^2}$$

$$\sqrt{949} \approx 30.8$$

$$\tan^{-1}\left(\frac{-25}{-18}\right)$$

$$\approx 54.2$$

$$+ 180^\circ$$

$$\underline{\hspace{2cm}}$$

$$234.2^\circ$$