6. $w = 12i - 22j$

$\sqrt{12^2+22^2}$

$\sqrt{628}$

unit vector $\vec{w}$: $\frac{12i}{\sqrt{628}} - \frac{22j}{\sqrt{628}}$

Pre-calculus
Review – Vectors

Name _____

1. Find the magnitude and direction angle of **v** = 5i – 9j

direction

$\tan^{-1}\left(-\frac{9}{5}\right) + 360^\circ \approx 299.1^\circ$

$\sqrt{5^2+9^2}$ magnitude

$\approx 10.3$

2. If **u** has an initial point of (-7,-6) and a terminal point of (4,12), write the vector in component form AND linear combination form.

$\langle 4 - -7, 12 - -6 \rangle$

$\langle 11, 18 \rangle$ OR $11i + 18j$

3. Find 5**u** – 2**v** if **u** = <10,8> and **v** = <3, -4>

$\langle 50, 40 \rangle + \langle -6, 8 \rangle$

$\langle 44, 48 \rangle$

4. Write a vector in component form whose magnitude is 52 and direction angle is 216°

$\langle 52\cos 216^\circ, 52\sin 216^\circ \rangle$

$\langle -42.1, -30.6 \rangle$

5. Find the dot product given **u** = <-22, 14> and **v** = <20, -11>

$(-22 \times 20) + (14 \times -11)$

$-440 + -154$

$-594$

6. If **u** = -2i -6j, **v** = 21i – 20j, and **w** = 12i – 22j, find the following; & Find the unit vector for each of these vectors.

a. **v** – 2**w**

$\langle 21, -20 \rangle + \langle -24, 44 \rangle$

$\langle -3, 24 \rangle$

b. 6 + ‖**v**‖

6 + "magnitude of v"

$6 + \sqrt{21^2+20^2}$

$6 + \sqrt{841}$

$6 + 29$

$35$

c. **u** • **w**

$(-2 \times 12) + (-6 \times -22)$

$-24 + 132$

$108$

6. $v = 21i - 20j$

$\sqrt{21^2+20^2}$

$\sqrt{441+400}$

$\sqrt{841}$

$= 29$

unit vector $\vec{v}$

$\frac{21i}{29} - \frac{20j}{29}$

6. unit vectors: divide each component by the magnitude

$u = \frac{-2i}{\sqrt{40}} - \frac{6j}{\sqrt{40}}$ ; $\frac{\sqrt{4+36}}{\sqrt{40}}$

$-\frac{\sqrt{10}}{10}, -\frac{3\sqrt{10}}{10}$

unit vector $\vec{u}$

7. Determine if the following vectors are orthogonal, parallel, or neither.

a. $u = \langle 8,4 \rangle$
$v = \langle 2,6 \rangle$

$u \cdot v = (8 \times 2) + (4 \times 6)$
$16 + 24$
$40$ ∴ not orthogonal

NEITHER

Slopes:
$\frac{4}{8} \stackrel{?}{=} \frac{6}{2}$

$8 = 24$ NO; not parallel

b. $u = \langle -10,-16 \rangle$
$v = \langle -8,5 \rangle$

$(-10 \times -8) + (-16 \times 5)$
$80 + -80$
$0$

ORTHOGONAL

c. $u = \langle 8,4 \rangle$
$v = \langle -2,-1 \rangle$

$(8 \times -2) + (4 \times -1)$
$-16 + -4$
$-20$
∴ not orthogonal

$\frac{4}{8} \stackrel{?}{=} \frac{-1}{-2}$

$-8 = -8$

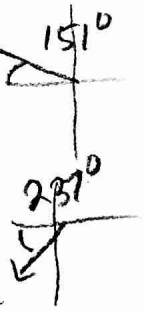
parallel

8. A Frisbee is thrown three times: 40 m at 210°, 60 meters at 105° and then 50 m at 317°. Determine the frisbee's resultant displacement and angle.

$\langle 40\cos 210°, 40\sin 210° \rangle$ $\langle -34.6, -20 \rangle$
$\langle 60\cos 105°, 60\sin 105° \rangle$ $+ \langle -15.5, 58.0 \rangle$
$\langle 50\cos 217°, 50\sin 217° \rangle$ $\langle -39.9, -30.1 \rangle$
$\langle -90, 7.9 \rangle$

$\tan^{-1}\left(\frac{-90}{7.9}\right) + 180°$
$\approx 95.0°$

magnitude
$\approx 90.3$ m




9. A wagon carrying Rebecca is being pulled by two of her older siblings with forces of 400N in a direction 29° north of west and 183 N in a direction 57° south of west. Determine the resultant force that is acting on the wagon and the direction.

$\langle 400\cos 151°, 400\sin 151° \rangle$ $\langle -349.8, 193.9 \rangle$
$\langle 183\cos 237°, 183\sin 237° \rangle$ $+ \langle -99.7, -153.5 \rangle$
$\langle -449.5, 40.4 \rangle$

$\tan^{-1}\left(\frac{40.4}{-449.5}\right) + 360°$
$354.9°$

10. A hot air balloon drifts 34 km in the direction 230°. An abrupt change in air movement carries the balloon 17 km in a direction 160°. Determine the balloon's resultant displacement and direction.

$\langle 34\cos 230°, 34\sin 230° \rangle$ $\langle -21.9, -26.0 \rangle$
$\langle 17\cos 160°, 17\sin 160° \rangle$ $+ \langle -16.0, 5.8 \rangle$
$\langle -37.9, -20.2 \rangle$

$\tan^{-1}\left(\frac{-20.2}{-37.9}\right) + 180°$
$208.1°$

mag:
$\sqrt{449.5^2 + 40.4^2}$
$\approx 451.3$

11. Determine the work done in moving an object from (3,11) to (-25, 8) by a force F $\langle -19, -6 \rangle$

$\langle -25-3, 8-11 \rangle$
$\langle -28, -3 \rangle$

$(-19 \times -28) + (-6 \times -3)$
$532 + 18$
550 joules

$\sqrt{37.9^2 + 20.2^2}$
$\approx 42.9$ km