Precalculus Name_____

Vector Operations Notes

Date_____ Period____

Find the component form of the resultant vector.

1) $\mathbf{u} = \langle -4, \sqrt{11} \rangle$
Find the vector opposite **u**

$\langle 4, -\sqrt{11} \rangle$

2) Given: $A = (3, 4)$ $B = (-3, 6)$
Find the vector opposite $\overrightarrow{AB}$

$\overrightarrow{BA} = \langle 6, -2 \rangle$

Express the resultant vector as a linear combination of unit vectors i and j.

3) $|\mathbf{f}| = 8, 240°$
Find the vector opposite **f**

angle in question for opposite f
↳ $-f \rightarrow 60°$

$8\cos 60\,i + 8\sin 60\,j$

$8 \cdot \frac{1}{2} i + 8 \frac{\sqrt{3}}{2} j$

$4i + 4\sqrt{3} j$

4) $\mathbf{f} = 6\mathbf{i} - 4\mathbf{j}$
Find: $-2\mathbf{f}$

$-12i + 8j$

5) Given: $P = (-2, -7)$ $Q = (-4, -5)$
Find: $2\overrightarrow{PQ}$

$2\langle -4 - -2, -5 - -7 \rangle$

$2\langle -2, 2 \rangle \longrightarrow \langle -4, 4 \rangle$

Find the component form of the resultant vector.

6) $\mathbf{a} = \langle 0, 2 \rangle$
$\mathbf{g} = \langle -12, 10 \rangle$
Find: $\mathbf{a} - \mathbf{g}$

$\langle 0 - -12, 2 - 10 \rangle$

$a + (-g)$ $\langle 12, -8 \rangle$

7) Given: $T = (2, -8)$ $X = (1, 4)$
$Y = (-2, 1)$ $Z = (10, 6)$
Find: $\overrightarrow{TX} + \overrightarrow{YZ}$

$\overrightarrow{TX} = \langle 1-2, 4--8 \rangle$
$= \langle -1, 12 \rangle$
$\overrightarrow{YZ} = \langle 10--2, 6-1 \rangle$
$= \langle 12, 5 \rangle$
$\overrightarrow{TX} + \overrightarrow{YZ} = \langle 11, 17 \rangle$

8) Given: $T = (-8, -3)$ $X = (-9, -6)$
$Y = (4, 7)$ $Z = (9, 9)$
Find: $2\overrightarrow{TX} + 4\overrightarrow{YZ}$

$\overrightarrow{TX} = \langle -9--8, -6--3 \rangle$
$= \langle -1, -3 \rangle$
$\overrightarrow{YZ} = \langle 9-4, 9-7 \rangle$
$= \langle 5, 2 \rangle$
$2\overrightarrow{TX} + 4\overrightarrow{YZ} = \langle -2+20, -6+8 \rangle = \langle 18, 2 \rangle$

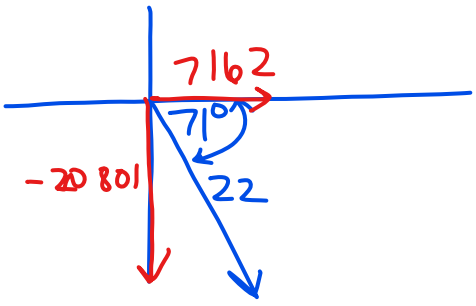
Express the resultant vector as a linear combination of unit vectors i and j.

9) $\mathbf{f} = 7\mathbf{i} - 4\mathbf{j}$
$\mathbf{v} = 5\mathbf{i} - 8\mathbf{j}$
Find: $6\mathbf{f} - 7\mathbf{v}$

$6(7i - 4j) - 7(5i - 8j)$
$42i - 24j - 35i + 56j$
$= 7i + 32j$

Draw a diagram to illustrate the horizontal and vertical components of the vector. Then find the value of each component.

10) $|\mathbf{m}| = 22, 289°$



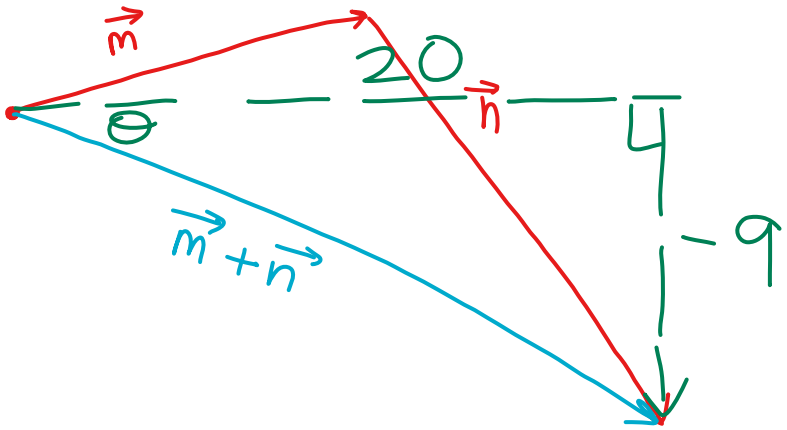
Horizontal component
$22\cos 289°$
7162

Vertical component
$22\sin 289°$
$-20\ 801$

Draw a vector diagram to find the resultant of each pair of vectors using the triangle method. Then state the magnitude and direction angle of the resultant.

11) $\mathbf{m} = \langle 11, 3 \rangle$ $\mathbf{n} = \langle 9, -12 \rangle$

$\vec{m}+\vec{n} = \langle 20, -9 \rangle$



$|\vec{m}+\vec{n}| = \sqrt{20^2+(-9)^2}$

$= \sqrt{481}$

$\theta = \tan^{-1}\left(\frac{9}{20}\right) = 24.228°$

$360° - 24.228°$

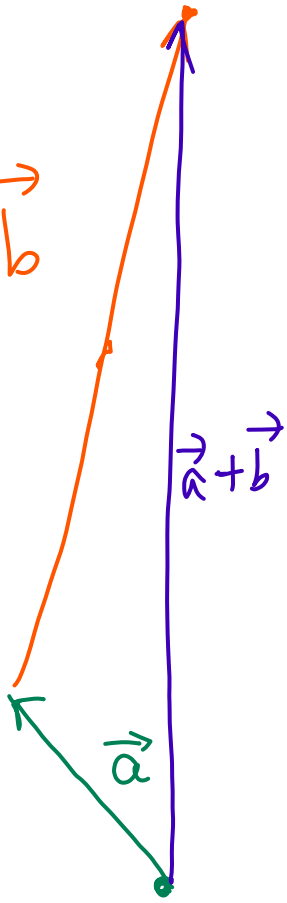
$= 335.772°$

12) $\mathbf{a} = \langle -3, 4 \rangle$ $\mathbf{b} = \langle 3, 13 \rangle$

$\vec{a}+\vec{b} = \langle 0, 17 \rangle$

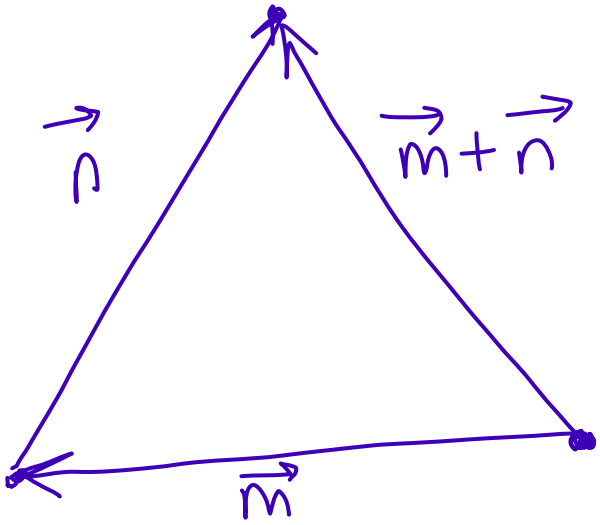
$|\vec{a}+\vec{b}| = 17$

90°



13) $\mathbf{m} = \langle -20, -1 \rangle$ $\mathbf{n} = \langle 8, 15 \rangle$

$\vec{m} + \vec{n} = \langle -12, 14 \rangle$



Mag. $2\sqrt{6^2+7^2}$

$2\sqrt{85}$

$= 18.44$

$\theta = \tan^{-1}\left(\frac{14}{12}\right)$

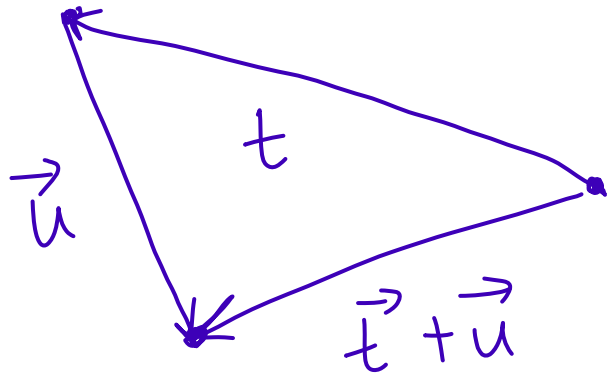
$= 49.398°$

$180° - 49.398°$

$= 130.602°$

14) $\mathbf{t} = \langle -15, 5 \rangle$ $\mathbf{u} = \langle 4, -10 \rangle$

$\vec{t} + \vec{u} = \langle -11, -5 \rangle$



Mag $\sqrt{(11)^2+5^2}$

$= \sqrt{146}$

$= 12.09$

$\tan^{-1}\left(\frac{5}{11}\right) = 24.44°$

$180 + 24.44°$

$= 204.44°$