8) (3 points) For the point $\left(4, \frac{3\pi}{2}\right)$, find a different representation of the point in polar form that satisfies the following conditions:

a) $r < 0$ and $\theta > 0$ $\quad$ $\boxed{\left(-4, \frac{\pi}{2}\right)}$

b) $r > 0$ and $\theta < 0$ $\quad$ $\boxed{\left(4, -\frac{\pi}{2}\right)}$

c) $r > 0$ and $\theta > 0$ $\quad$ $\boxed{\left(4, \frac{7\pi}{2}\right)}$

9) (3 points) Convert the rectangular point $(-5,-5)$ to the polar format (r,θ):

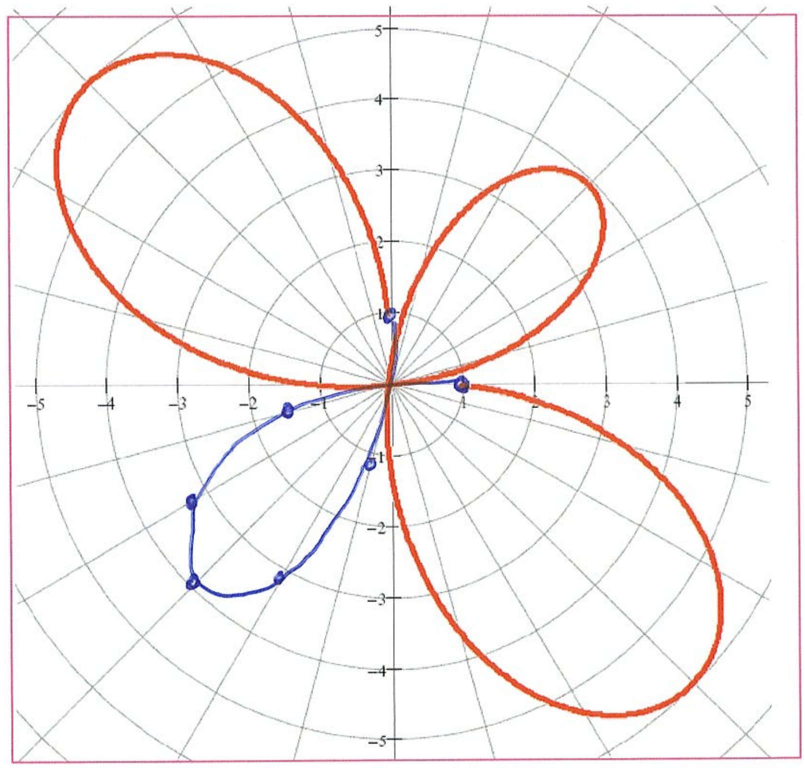
$r = \sqrt{(-5)^2 + (-5)^2} = \sqrt{50} = 5\sqrt{2}$

$\left.\begin{array}{l} \cos\theta = \frac{x}{r} = \frac{-5}{5\sqrt{2}} = -\frac{\sqrt{2}}{2} \\ \sin\theta = \frac{y}{r} = \frac{-5}{5\sqrt{2}} = -\frac{\sqrt{2}}{2} \end{array}\right\} \theta = \frac{5\pi}{4}$ or $225°$

$\boxed{\left(5\sqrt{2}, \frac{5\pi}{4}\right) \text{ or } 225°}$

10) (5 points) Finish the **polar graph** of $r = 1 - 5\sin(2\theta)$ by filling in the chart and plotting points. Round answers to one decimal place:

θ	r
0°	1
15°	−1.5
30°	−3.3
45°	−4
60°	−3.3
75°	−1.5
90°	1



pretty!

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11) (4 points) For the given vectors, determine algebraically if they are equivalent.

$\vec{u}$ has initial point at $(6,-3)$ and terminal point at $(9,5)$

$\vec{v}$ has initial point at $(-4,3)$ and terminal point at $(-7,-5)$

magnitude

$\|\vec{u}\| = \sqrt{(9-6)^2+(5-(-3))^2} = \sqrt{73}$

$\|\vec{v}\| = \sqrt{(-7-(-4))^2+(-5-3)^2} = \sqrt{73}$

direction

$m_{\vec{u}} = \frac{5-(-3)}{9-6} = \frac{8}{3}$

$m_{\vec{v}} = \frac{-5-3}{-7-(-4)} = \frac{8}{3}$

Nope!

or component form

$\vec{u} = \langle 9-6, 5-(-3)\rangle = \langle 3,8\rangle$

$\vec{v} = \langle -7-(-4), -5-3\rangle = \langle -3,-8\rangle$

nope!

12) (3 points each) Let $\vec{u} = \langle 3,-2\rangle$ and $\vec{v} = \langle -1,1\rangle$. Find and simplify:

a) $2\vec{u} - 2\vec{v}$

$\langle 6,-4\rangle + \langle 2,-2\rangle$

$= \boxed{\langle 8,-6\rangle}$

b) $|2\vec{u} - 2\vec{v}|$

$= \sqrt{8^2+(-6)^2}$

$= 10$

c) The unit vector in the same direction as $2\vec{u} - 2\vec{v}$:

$= \frac{1}{10}\langle 8,-6\rangle$

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

d) $\vec{u}\cdot\vec{v}$:

$= 3(-1) + (-2)(1)$

$= \boxed{-5}$

e) The angle between the vectors $\vec{u}$ and $\vec{v}$. Round to two decimal places. Use the formula $\cos\theta = \frac{\vec{u}\cdot\vec{v}}{|\vec{u}||\vec{v}|}$.

$|\vec{v}| = \sqrt{(-1)^2+1^2} = \sqrt{2}$

$|\vec{u}| = \sqrt{3^2+(-2)^2} = \sqrt{13}$

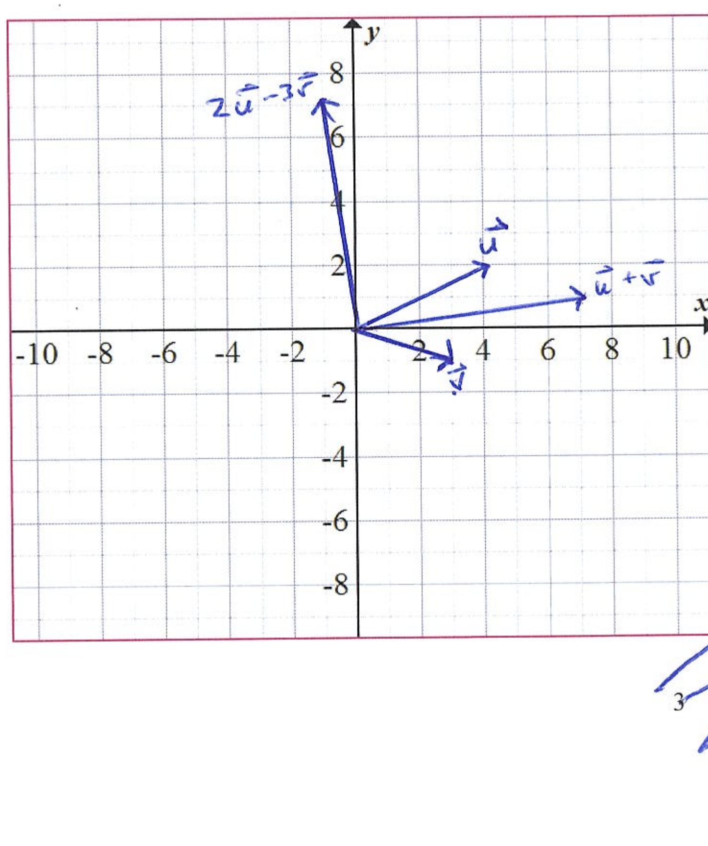
$\cos\theta = \frac{-5}{\sqrt{13}\cdot\sqrt{2}}$

$\theta = \cos^{-1}\left(\frac{-5}{\sqrt{13}\cdot\sqrt{2}}\right) \approx \boxed{168.69^\circ}$

13) (4 points) Given the vector $\vec{u} = \langle 4,2\rangle$ and $\vec{v} = \langle 3,-1\rangle$, draw the vectors $\vec{u}, \vec{v},\ \vec{u}+\vec{v}$, and $2\vec{u} - 3\vec{v}$:

$\vec{u} + \vec{v} = \langle 7,1\rangle$

$2\vec{u} - 3\vec{v} = \langle -1,7\rangle$



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14) (8 points) Link is traveling in a boat on a bearing of $N28°E$ from Nintendo Island to his new home of Sony Land. His boat travels at a rate of 20 mph. The water has a current from the west at a rate of 3 mph. After an hour, how far is Link from Nintendo Island? Also determine the bearing of the boat from the island. Round **only the final answer** to two places using the formula $\vec{v} = |\vec{v}|(\cos\theta \vec{i} + \sin\theta \vec{j})$.

$28°$, $\vec{b}$, 20, $62°$

$\vec{b} = 20(\cos 62° \vec{i} + \sin 62° \vec{j})$

$\vec{w} = 3(\cos 0° \vec{i} + \sin 0° \vec{j})$

$\vec{b} + \vec{w} = \underbrace{(20\cos 62° + 3\cos 0°)}_{A}\vec{i} + \underbrace{(20\sin 62° + 3\sin 0°)}_{B}\vec{j}$

3, $\vec{w}$, $0°$

$|\vec{b} + \vec{w}| = \sqrt{A^2 + B^2} \approx \boxed{21.57 \text{ miles}}$

$\vec{b}+\vec{v}$, θ, B, A

$\theta = \tan^{-1}\left(\frac{A}{B}\right) = 35.05°$ $\boxed{N\ 35.05°E}$

15) (4 points) Stefani pulls a wagon full of aluminum cans to recycle at a force of 20 pounds on the wagon's handle which makes an angle of 32° to the horizontal. See the figure below. How much work is done pulling the wagon 150 feet? Use the formula $\cos\theta = \frac{\vec{u} \cdot \vec{v}}{|\vec{u}||\vec{v}|}$ and recall that work $= \vec{F} \bullet \overrightarrow{AB}$.

$\vec{F} \cdot \overrightarrow{AB} = |\vec{F}||\overrightarrow{AB}|\cos\theta$

$= \underset{\text{lb}}{20} \cdot \underset{\text{ft}}{150} \cdot \cos 32°$

$= 2544.14$ ft-lb.

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