Vector **r** has initial point $(4, -11)$ and terminal point $(-8, -6)$. **SCORE: ___ / 5 POINTS**

Vector **s** has magnitude 6 and direction angle $\frac{\pi}{4}$. If $\mathbf{v} = 3\mathbf{s} - 2\mathbf{r}$, write **v** as a linear combination of **i** and **j**.

$\vec{r} = \langle -8-4, -6-{-11} \rangle = \langle -12, 5 \rangle$ 1

$\vec{s} = \langle 6\cos\frac{\pi}{4}, 6\sin\frac{\pi}{4} \rangle = \langle 3\sqrt{2}, 3\sqrt{2} \rangle$ 1

$\vec{v} = 3\langle 3\sqrt{2}, 3\sqrt{2} \rangle - 2\langle -12, 5 \rangle = \langle 9\sqrt{2}+24, 9\sqrt{2}-10 \rangle$

1 1

$= (9\sqrt{2}+24)\vec{i} + (9\sqrt{2}-10)\vec{j}$ 1

Let $\mathbf{w} = 3\,\mathbf{j} - 2\,\mathbf{i}$. **SCORE: ___ / 4 POINTS**

[a] Find the component form of the unit vector in the same direction as **w**.

$\frac{1}{\|\vec{w}\|}\vec{w} = \frac{1}{\sqrt{13}}\langle -2, 3 \rangle = \left\langle \frac{-2}{\sqrt{13}}, \frac{3}{\sqrt{13}} \right\rangle$ 1 $1\frac{1}{2}$

[b] Find the component form of the vector with magnitude 4 in the same direction as **w**.

$4\left\langle \frac{-2}{\sqrt{13}}, \frac{3}{\sqrt{13}} \right\rangle = \left\langle \frac{-8}{\sqrt{13}}, \frac{12}{\sqrt{13}} \right\rangle$ $1\frac{1}{2}$

Find the magnitude and direction angle of the vector $< -3, \sqrt{3} >$. **SCORE: ___ / 2 POINTS**

$\|\langle -3, \sqrt{3} \rangle\| = \sqrt{12} = 2\sqrt{3}$ $\frac{1}{2}$ $\theta = \pi + \tan^{-1} -\frac{\sqrt{3}}{3} = \pi - \frac{\pi}{6} = \frac{5\pi}{6}$ $\frac{1}{2}$ 1

If $\mathbf{m} = < 7, -5 >$ and $\mathbf{n} = < -2, -4 >$, find $\mathbf{m} \cdot \mathbf{n}$. **SCORE: ___ / 2 POINTS**

$7(-2) + (-5)(-4) = 6$

1 1

If **g** has magnitude 4, and **h** has magnitude 5, and the angle between the vectors is $\frac{\pi}{6}$, find $\mathbf{g} \cdot \mathbf{h}$. **SCORE: ___ / 2 POINTS**

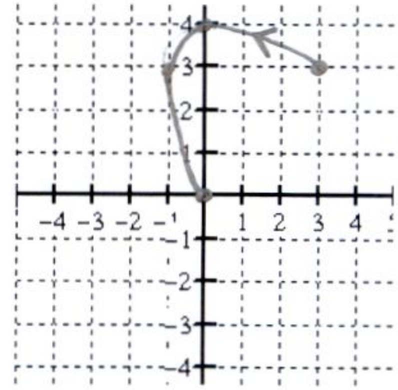
$\|\vec{g}\|\,\|\vec{h}\| \cos\theta = 4 \cdot 5 \cdot \cos\frac{\pi}{6} = 10\sqrt{3}$

1 1

Sketch the curve represented by the parametric equations $\begin{matrix} x = t^2 - 2t \\ y = 4 - t^2 \end{matrix}$, $-1 \le t \le 2$, **SCORE: ___ / 4 POINTS**

and indicate the orientation of the curve.

t	x	y
-1	3	3
0	0	4
1	-1	3
2	0	0



Find the simplified rectangular equation corresponding to the parametric equations $\begin{matrix} x = 1 + 2\tan t \\ y = 3\sec t \end{matrix}$. **SCORE: ___ / 4 POINTS**

$\tan t = \frac{x-1}{2}$ 1

$\sec t = \frac{y}{3}$ 1

$\sec^2 t = 1 + \tan^2 t$

$\frac{y^2}{9} = 1 + \frac{(x-1)^2}{4}$

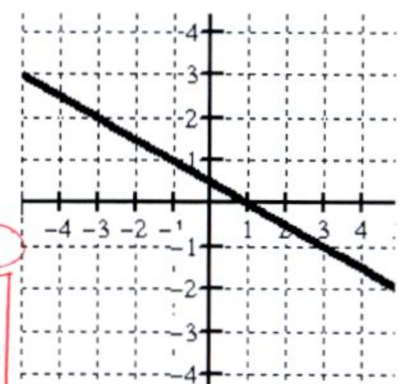
$\frac{y^2}{9} - \frac{(x-1)^2}{4} = 1$

EITHER ONE

2

The parametric equations $\begin{matrix} x = 1 - 2t^2 \\ y = t^2 \end{matrix}$ and $\begin{matrix} x = 1 - 2\cos 2t \\ y = \cos 2t \end{matrix}$ **SCORE: ___ / 3 POINTS**

both correspond to the rectangular equation $x = 1 - 2y$, whose graph is shown on the right.
Describe how their plane curves differ from each other.



FIRST CURVE: $y=t^2$ GOES FROM ∞ TO 0 TO ∞
SO CURVE STARTS AT UPPER LEFT,
GOES DOWN TO X-AXIS AT (1, 0)
AND GOES BACK TO UPPER LEFT 2

SECOND CURVE: $y = \cos 2t$ GOES BETWEEN -1 AND 1
SO CURVE GOES BETWEEN (3, -1) AND (-1, 1) 1

The diameter of a circle has endpoints $(-1, -4)$ and $(7, -10)$. Find parametric equations for the circle. **SCORE: ___ / 4 POINTS**

CENTER $= \left(\frac{-1+7}{2}, \frac{-4+-10}{2}\right) = (3, -7)$ 1

RADIUS $= \frac{1}{2}\sqrt{(7--1)^2 + (-10--4)^2}$

$= \frac{1}{2}\sqrt{100}$

$= 5$ 1

$x = 3 + 5\cos t$

$y = -7 + 5\sin t$

1 $1\frac{1}{2}$