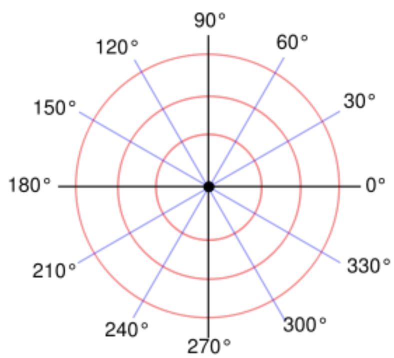
NAME:____________________________ / 60 = [%]

MATH 127 TEST 3 SAMPLE

NOTE: The actual exam will only have 11 questions. The different parts of each question (parts A, B) are variations. Know how to do all the variations on this exam.

1A.) (4 pts) Plot $\left(-2,\ -210^\circ\right)$ on the polar grid provided. Then find an equivalent point such that:

a.) $-360^\circ \le \theta < 0$, $r > 0$ ____________________

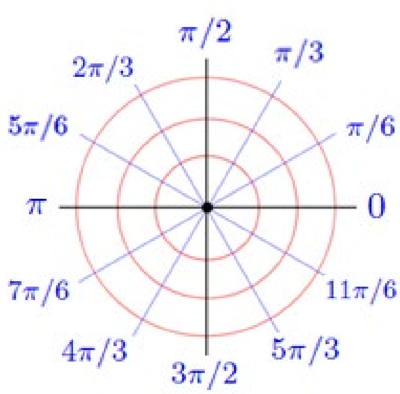


b.) $0 \le \theta < 360^\circ$, $r < 0$ ____________________

c.) $360 \le \theta < 720^\circ$, $r > 0$ ____________________

1B.) (4 pts) Plot $\left(-3,\ \dfrac{2\pi}{3}\right)$ on the polar grid provided. Then find an equivalent point such that:

a.) $-2\pi \le \theta < 0$, $r > 0$ ____________________



b.) $0 \le \theta < 2\pi$, $r < 0$ ____________________

c.) $2\pi \le \theta < 4\pi$, $r > 0$ ____________________

2A.) (4 pts) Convert $\left(-3,\ 3\sqrt{3}\right)$ into polar coordinates with r > 0 and $0 \le \theta \le 2\pi$. 2A.______________________

2B.) (4 pts) Convert $\left(-4,\ \frac{5\pi}{6}\right)$ into rectangular coordinates. 2B.______________________

3A.) (4 pts) Convert $4\cos^2\theta + 9\sin^2\theta = \frac{36}{r^2}$ into a **rectangular** equation. Show all work for full credit.

a.) $4x + 9y = 36$

b.) $4x^2 + 9y^2 = 36$

c.) $4r^2\cos^2\theta + 9r^2\sin^2\theta = 36$

d.) $4y^2 + 9x^2 = 36$

e.) None of the above

What is the graph of the polar coordinate equation $4\cos^2\theta + 9\sin^2\theta = \frac{36}{r^2}$? Choose below:

a.) parabola b.) line c.) hyperbola d.) ellipse

3B.) (4 pts) Convert $r\sin\theta - 4 = r^2\cos^2\theta - 4r\cos\theta$ into a **rectangular** equation. Show all work for full credit.

a.) $x = (y-2)^2$

b.) $x^2 - 4x - 4 = y$

c.) $y = (x-2)^2$

d.) $r\sin\theta = r^2\cos^2\theta - 4r\cos\theta + 4$

e.) None of the above

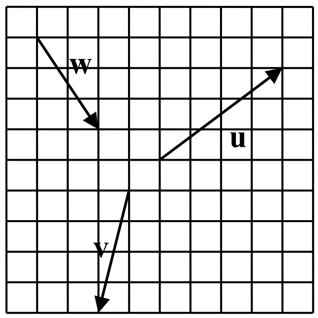
What is the graph of the polar coordinate equation $r\sin\theta - 4 = r^2\cos^2\theta - 4r\cos\theta$? Choose below.

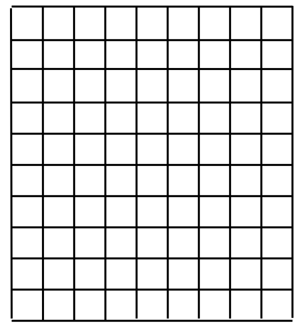
a.) parabola b.) line c.) hyperbola d.) ellipse

4A.) (4 pts) Convert $x^2 = 6y$ into a **polar** equation. Solve for r. 4A.______________________

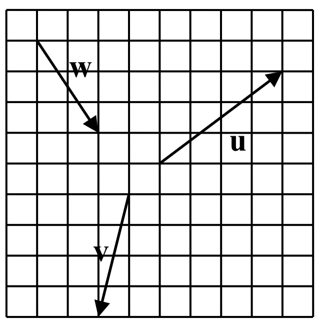
4B.) (4 pts) Convert $3x + y = 7$ into a **polar** equation. Solve for r. 4B.______________________

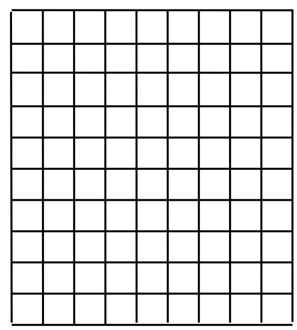
5A.) (4 pts) Use the following vectors to draw **u – 2w** + **v**.





5B.) (4 pts) Use the following vectors to draw **u** – **w** – **2v**.





6A.) (5 points) Given $v = -2\boldsymbol{i} + 3\boldsymbol{j}$ and $w = 6\boldsymbol{i} + 4\boldsymbol{j}$, find the following:

i. $\|v\|$ 6i.____________________

ii. $\|w\|$ 6ii.____________________

iii $v \cdot w$ 6iii.____________________

iv. $2v - 3w$ 6iv.____________________

v.) Unit vector u in the same direction as v. 6v.____________________

6B.) (5 points) Given $v = \frac{1}{2}\boldsymbol{i} - \frac{7}{2}\boldsymbol{j}$ and $w = 12\boldsymbol{i} + 5\boldsymbol{j}$, find the following:

i. $\|v\|$ 6i.____________________

ii. $\|w\|$ 6ii.____________________

iii $v \cdot w$ 6iii.____________________

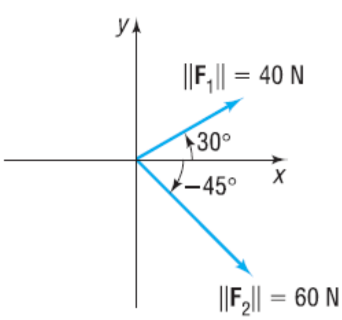
iv. $4v - w$ 6iv.____________________

v.) Unit vector u in the same direction as w. 6v.____________________

7A.) (6 pts) Two forces of magnitude 40 Newtons (N) and 60 Newtons act on an object at angles of 30 degrees and -45 degrees with the positive axis, as shown in the figure. Find the direction and magnitude of the resultant force; that is, find $F_1 + F_2$.

Magnitude:______________

Direction:______________

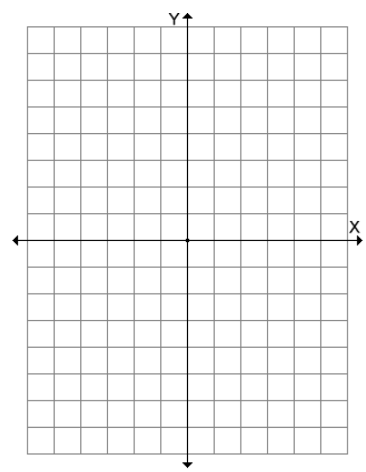


7B.) (6 pts) One force of 4.12 pounds acts on an object at an angle of 194.04 degrees. Another force of 10 pounds acts on the same object at an angle of 143.13 degrees. Find the magnitude and direction of the resultant force.

Magnitude:______________

Direction:_______________

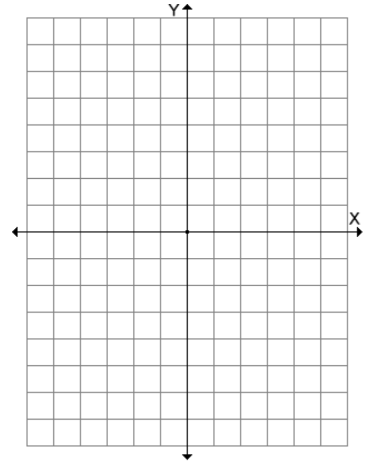
8A.) (8 pts) Use the equation $\frac{x^2}{36}+\frac{y^2}{16}=1$ to find the following and graph.



Foci:___________________ Vertices:_____________________ Eccentricity:___________ Center:__________

Length of major axis:_____________________ Length of minor axis:______________________

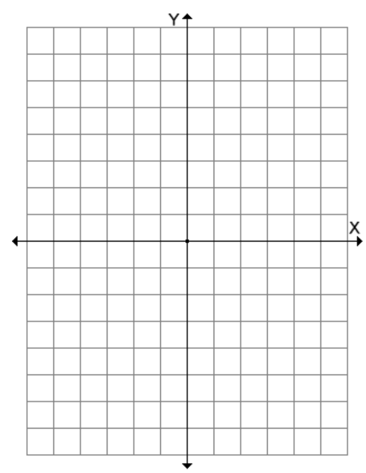
8B.) (8 pts) Use the equation $16x^2 + y^2 - 96x + 8y + 144 = 0$ to find the following and graph.



Foci:___________________ Vertices:_____________________ Eccentricity:___________ Center:__________

Length of major axis:_____________________ Length of minor axis:______________________

9A.) (9 pts) Use the equation $4x^2 - 9y^2 + 16x + 18y - 29 = 0$ to find the following and graph.

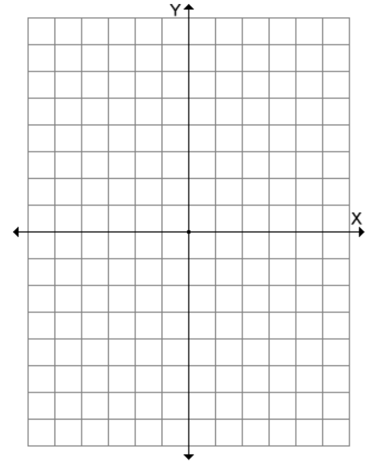


Foci:_____________________ Vertices:______________________ Eccentricity:___________

Asymptotes:_____________________________ Center:_________________

Length of transverse axis:_________________ Length of conjugate axis:_____________

9B.) (9 pts) Use the equation $16y^2 - x^2 = 16$ to find the following and graph.

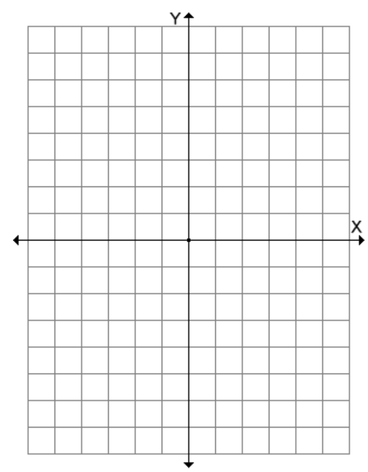


Foci:____________________ Vertices:_____________________ Eccentricity:___________

Asymptotes:____________________________ Center:_________________

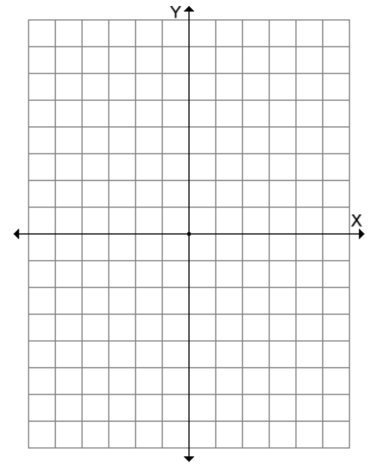
Length of transverse axis:_________________ Length of conjugate axis:____________

10A.) (6 pts) Use the equation $y^2 + 8x + 6y = 7$ to find the following and graph.



Directrix:_____________ Focus:________________ Focal Width:___________ Vertex:_____________

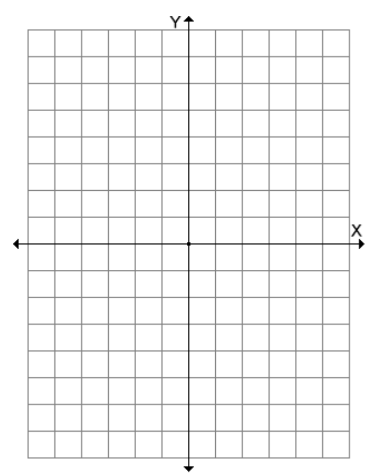
10B.) (6 points) Use the equation $x^2 = 5y$ to find the following and graph.



Directrix:______________ Focus:_________________ Focal Width:____________ Vertex:______________

11A.) (6 pts) Fill in the table, graph, and eliminate the parameter:

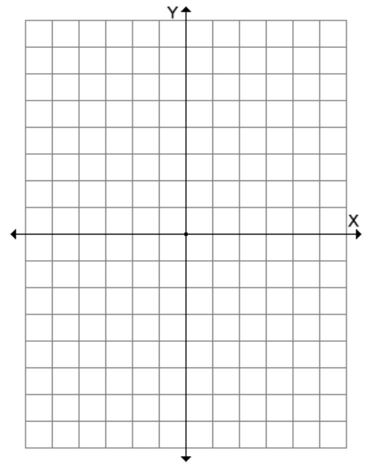
	$x = 2\cos t$	$y = 5\sin t$	(x, y)
0			
$\frac{\pi}{2}$			
π			
$\frac{3\pi}{2}$			
2π			



Eliminate the parameter: ______________________

11B.) (6 pts) Fill in the table, graph, and eliminate the parameter:

	$x = t + 2$	$y = \frac{8}{t}$	(x, y)
–8			
–6			
–4			
–2			
–1			



Eliminate the parameter: ___________________________

FORMULA SHEET

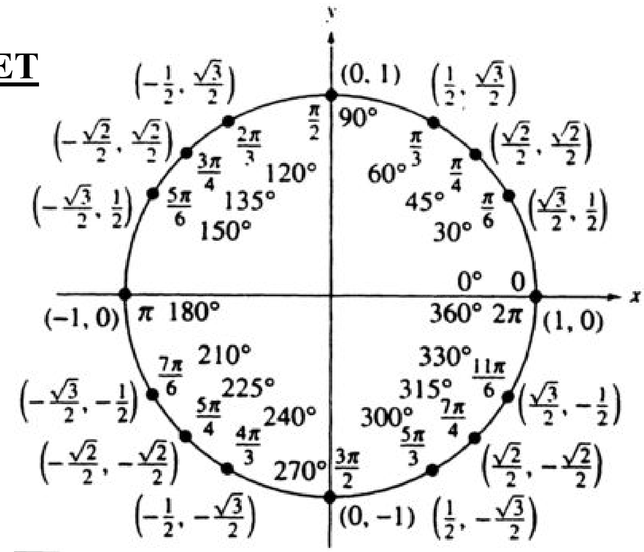
$$(r,\ \theta)=(r,\ \theta\pm 2\pi)\ \text{or}\ (r,\ \theta)=(r,\ \theta\pm 360^\circ)$$
$$(r,\ \theta)=(-r,\ \theta\pm \pi)\ \text{or}\ (r,\ \theta)=(-r,\ \theta\pm 180^\circ)$$

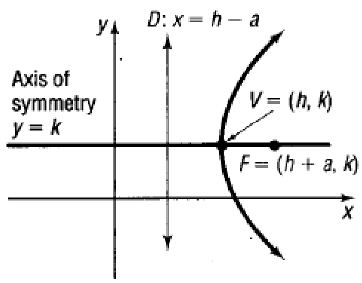
$x = r\cos\theta$ $\qquad\theta=\tan^{-1}\dfrac{y}{x}$ if (x,y) in Quad 1 or 4

$y = r\sin\theta$

$x^2+y^2=r^2$ $\qquad\theta=\tan^{-1}\dfrac{y}{x}+\pi$ if (x,y) in Quad 2 or 3

$r=\sqrt{x^2+y^2}$





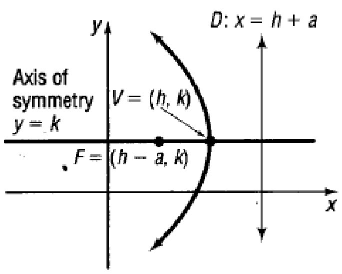
(a) $(y-k)^2=4a(x-h)$

$$\|v\|=\sqrt{a^2+b^2}\qquad u=\frac{v}{\|v\|}\qquad v=\|v\|\cos\theta\,\mathbf{i}+\|v\|\sin\theta\,\mathbf{j}$$

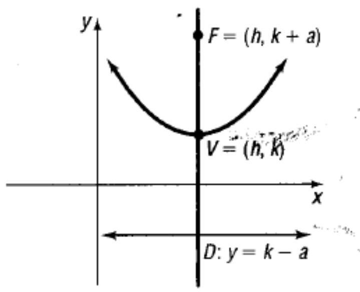
$\theta=\tan^{-1}\left(\dfrac{b}{a}\right)$ if the resultant vector is quadrant 1 or 4.

$\theta=\tan^{-1}\left(\dfrac{b}{a}\right)+180^\circ$ if the resultant is in quadrant 2 or 3.

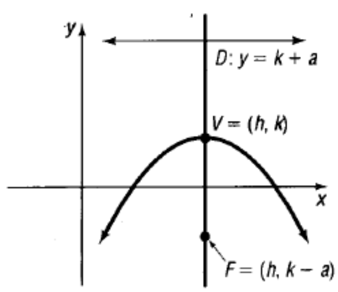
If $u=\langle a_1,b_1\rangle$ and $v=\langle a_2,b_2\rangle$ then $u\cdot v=a_1\cdot a_2+b_1\cdot b_2$



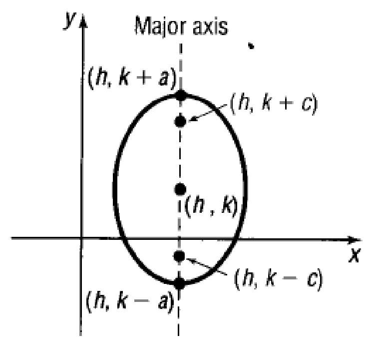
(b) $(y-k)^2=-4a(x-h)$



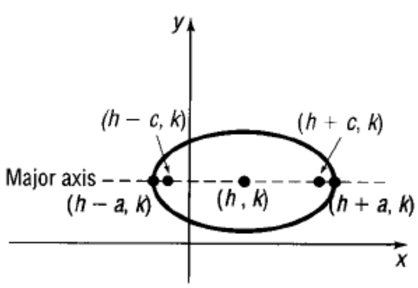
(c) $(x-h)^2=4a(y-k)$



(d) $(x-h)^2=-4a(y-k)$



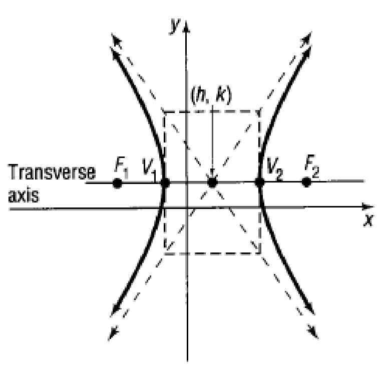
(b) $\dfrac{(x-h)^2}{b^2}+\dfrac{(y-k)^2}{a^2}=1$



(a) $\dfrac{(x-h)^2}{a^2}+\dfrac{(y-k)^2}{b^2}=1$

For Ellipses: $c=\sqrt{a^2-b^2}$

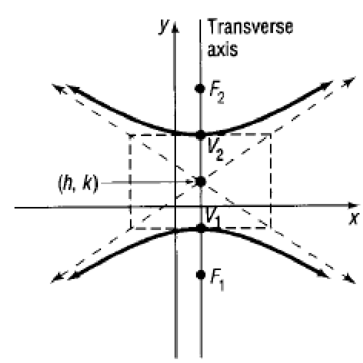
For Hyperbolas: $c=\sqrt{a^2+b^2}$



(a) $\dfrac{(x-h)^2}{a^2}-\dfrac{(y-k)^2}{b^2}=1$

Asymptotes: $y-k=\pm\dfrac{b}{a}(x-h)$

Vertices: $(h\pm a,\ k)$, Foci: $(h\pm c,\ k)$



(b) $\dfrac{(y-k)^2}{a^2}-\dfrac{(x-h)^2}{b^2}=1$

Asymptotes: $y-k=\pm\dfrac{a}{b}(x-h)$

Vertices: $(h,\ k\pm a)$, Foci: $(h,\ k\pm c)$