

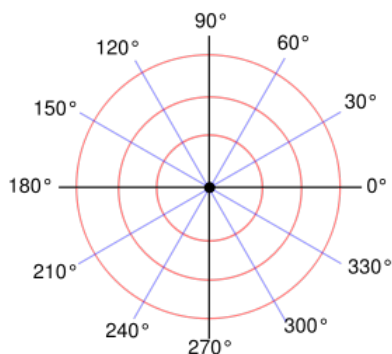
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MATH 127 TEST 3 SAMPLE

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 $(-2, -210^\circ)$ on the polar grid provided. Then find an equivalent point such that:

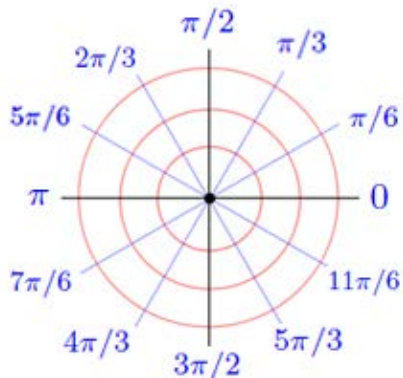


a.) $-360^\circ \leq \theta < 0$, $r > 0$ _____

b.) $0 \leq \theta < 360^\circ$, $r < 0$ _____

b.) $360 \leq \theta < 720^\circ$, $r > 0$ _____

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



a.) $-2\pi \leq \theta < 0$, $r > 0$ _____

b.) $0 \leq \theta < 2\pi$, $r < 0$ _____

b.) $2\pi \leq \theta < 4\pi$, $r > 0$ _____

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

2A. _____

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

2B. _____

3A.) (4 pts) Convert $r = 12 \cos \theta - 16 \sin \theta$ into a **rectangular** equation. Show all work for full credit.

a.) $(x + 6)^2 + (y - 8)^2 = 100$

b.) $x^2 + y^2 + 12x - 16y = 0$

c.) $r^2 - 12r \cos \theta - 16r \sin \theta = 0$

d.) $(x - 6)^2 + (y + 8)^2 = 100$

e.) None of the above

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

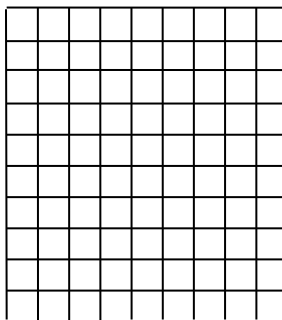
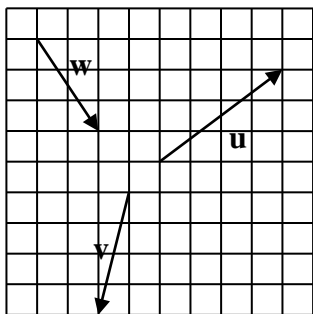
4A.) (4 pts) Convert $x^2 = 6y$ into a **polar** equation. Solve for r .

4A. _____

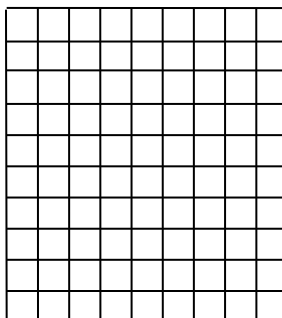
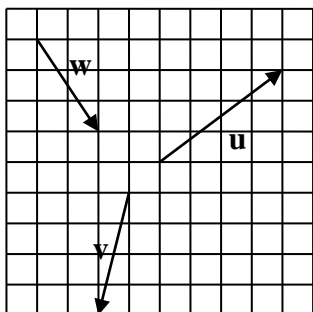
4B.) (4 pts) Convert $3x + y = 7$ into a **polar** equation. Solve for r .

4B. _____

5A.) (4 pts) Use the following vectors to draw $\mathbf{u} - 2\mathbf{w} + \mathbf{v}$.



5B.) (4 pts) Use the following vectors to draw $\mathbf{u} - \mathbf{w} - 2\mathbf{v}$.



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

i. $\|\mathbf{v}\|$

6i. _____

ii. $\|\mathbf{w}\|$

6ii. _____

iii. $2\mathbf{v} - 3\mathbf{w}$

6iii. _____

iv.) Unit vector \mathbf{u} in the same direction as \mathbf{v} .

6iv. _____

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

i. $\|v\|$

6i. _____

ii. $\|w\|$

6ii. _____

iii. $4v - w$

6iii. _____

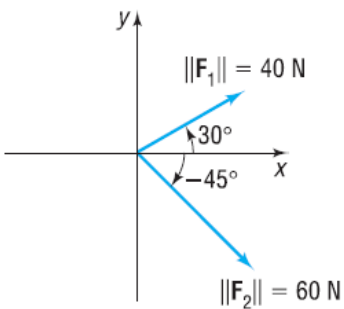
iv.) Unit vector u in the same direction as w .

6iv. _____

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: _____

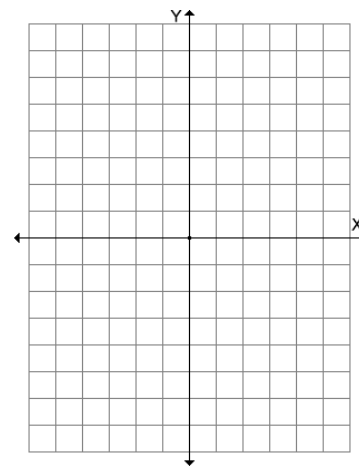


7B.) (6 pts) One force of 4.12 pounds acts on an object at an angle of 194.04 degrees. Another force of 10 pounds acts on the same object at an angle of 143.13 degrees. Find the magnitude and direction of the resultant force.

Magnitude: _____

Direction: _____

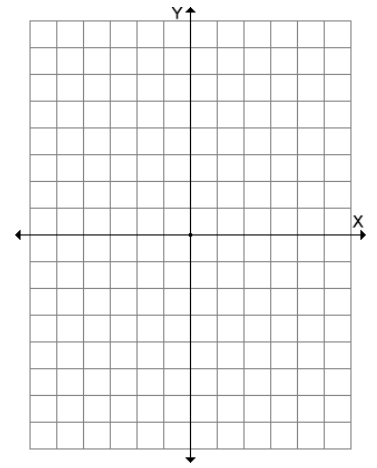
8A.) (8 pts) Use the equation $\frac{x^2}{36} + \frac{y^2}{16} = 1$ to find the following and graph.



Foci: _____ Vertices: _____ Eccentricity: _____ Center: _____

Length of major axis: _____ Length of minor axis: _____

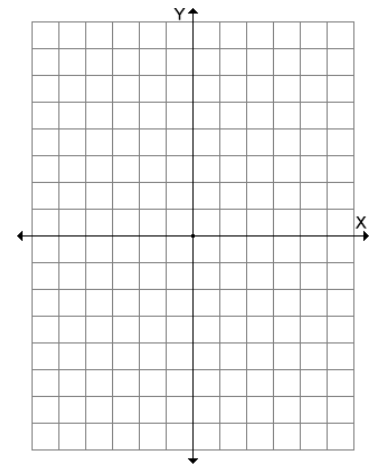
8B.) (8 pts) Use the equation $16x^2 + y^2 - 96x + 8y + 144 = 0$ to find the following and graph.



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.

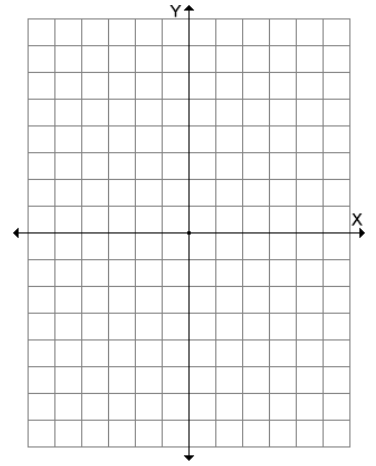


Foci: _____ Vertices: _____ Eccentricity: _____

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.

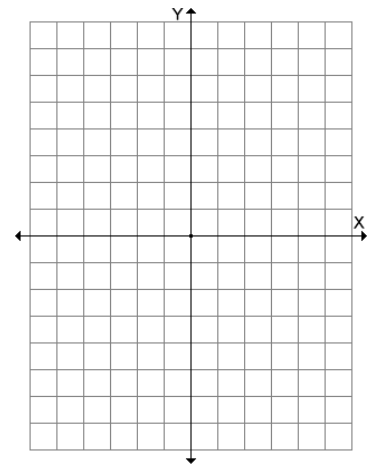


Foci: _____ Vertices: _____ Eccentricity: _____

Asymptotes: _____ Center: _____

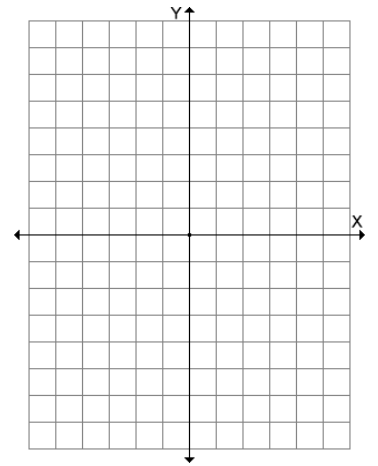
Length of transverse axis: _____ Length of conjugate axis: _____

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



Directrix: _____ Focus: _____ Focal Width: _____ Vertex: _____

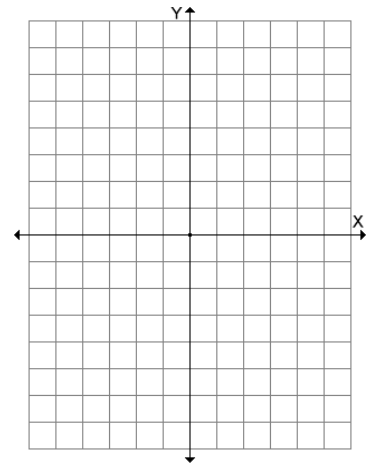
10B.) (6 points) Use the equation $x^2 = 5y$ to find the following and graph.



Directrix: _____ Focus: _____ Focal Width: _____ Vertex: _____

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

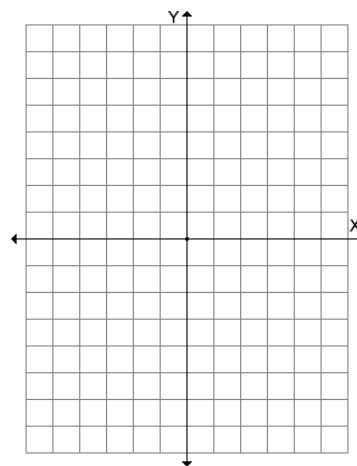
| | $x = 2 \cos t$ | $y = 5 \sin t$ | (x, y) |
|------------------|----------------|----------------|----------|
| 0 | | | |
| $\frac{\pi}{2}$ | | | |
| π | | | |
| $\frac{3\pi}{2}$ | | | |
| 2π | | | |



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

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

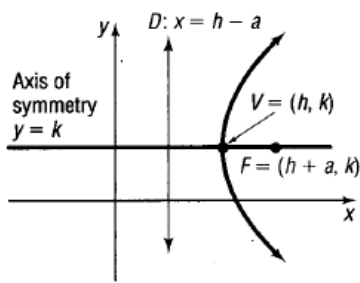
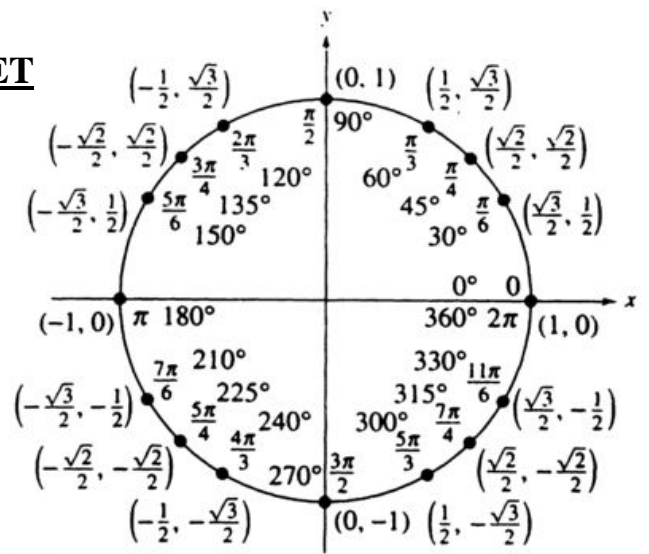
$$(r, \theta) = (-r, \theta \pm \pi) \text{ or } (r, \theta) = (-r, \theta \pm 180^\circ)$$

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

$$y = r \sin \theta$$

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

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

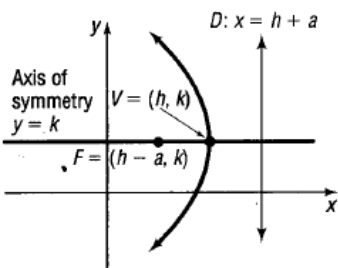


(a) $(y - k)^2 = 4a(x - h)$

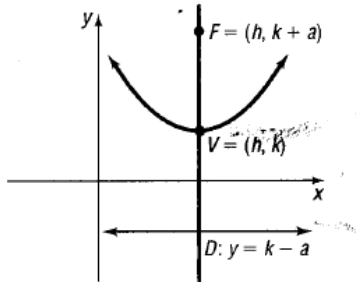
$$\|v\| = \sqrt{a^2 + b^2} \quad u = \frac{v}{\|v\|} \quad v = \|v\| \cos \theta \mathbf{i} + \|v\| \sin \theta \mathbf{j}$$

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

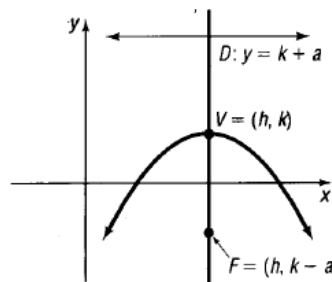
$$\theta = \tan^{-1} \left(\frac{b}{a} \right) + 180^\circ \text{ if the resultant is in quadrant 2 or 3.}$$



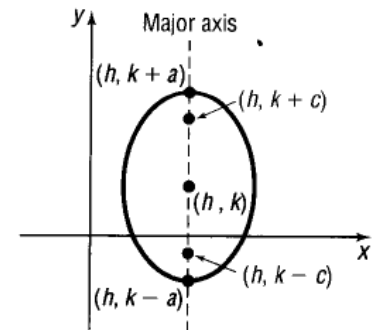
(b) $(y - k)^2 = -4a(x - h)$



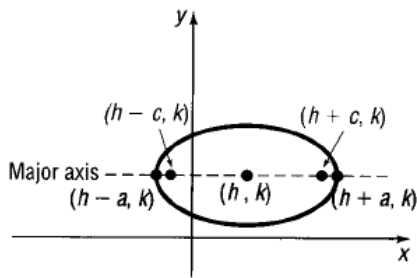
(c) $(x - h)^2 = 4a(y - k)$



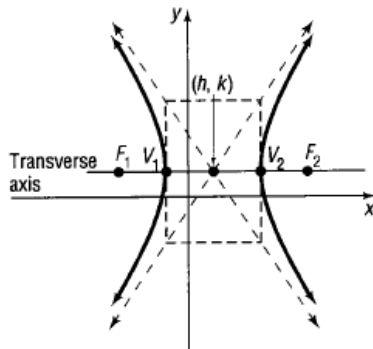
(d) $(x - h)^2 = -4a(y - k)$



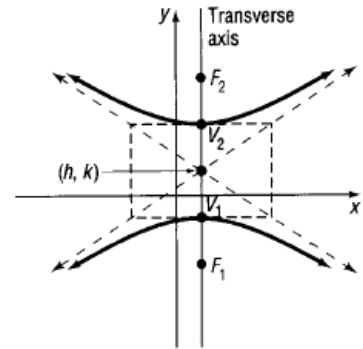
(b) $\frac{(x - h)^2}{b^2} + \frac{(y - k)^2}{a^2} = 1$



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



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



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

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

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

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

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

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

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

MATH 127 TEST 3 REVIEW PROBS

| <u>Section</u> | <u>Problems</u> |
|-----------------------|---|
| 7.1 | #13 – 22, 23 – 31, 33 – 38, 39 – 44, 45 – 56, 57 – 64 |
| 7.4 | #17 – 20, 55 – 60, 61 – 66, 93 – 96 (Find magnitude and direction of resultant) |
| 10.1 | #13 – 20, 23 – 30, 33 – 38 (also find length of major and minor axis, eccentricity) |
| 10.2 | #13 – 18, 23 – 26, 33 – 38 (and transverse, conjugate, eccentricity) |
| 10.3 | #27 – 34, 35 – 38, 45 – 50 (find focus, focal width, vertex, directrix) |
| 10.6 | #11 – 24 |

Test will be closed-book, and no notes are allowed (no notecards are allowed either). However a formula sheet will be attached to the exam, as shown in this sample test. The exam will consist of problems similar to the ones on the sample test and the above list of review problems.