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 \(0 \leq \theta \leq 2\pi\). 

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

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 \( r \).  

4B.) (4 pts) Convert \( 3x + y = 7 \) into a **polar** equation. Solve for \( r \).
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 \( v = -2i + 3j \) and \( w = 6i + 4j \), find the following:

i. \( \|v\| \)  

ii. \( \|w\| \)  

iii. \( 2v - 3w \)  

iv.) Unit vector \( u \) in the same direction as \( v \).
6B.) (5 points) Given \( v = \frac{1}{2}i - \frac{7}{2}j \) and \( w = 12i + 5j \), find the following:

i. \( \|v\| \)

ii. \( \|w\| \)

iii. \( 4v - w \)

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

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 \( F_1 + F_2 \).
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: 

\[ \frac{x^2}{36} + \frac{y^2}{16} = 1 \]
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:

<table>
<thead>
<tr>
<th>$t$</th>
<th>$x = 2 \cos t$</th>
<th>$y = 5 \sin t$</th>
<th>$(x, y)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\frac{\pi}{2}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\pi$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\frac{3\pi}{2}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$2\pi$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>$x = t + 2$</th>
<th>$y = \frac{8}{t}$</th>
<th>(x, y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>−8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>−6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>−4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>−2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>−1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Eliminate the parameter: _________________________
\[ (r, \theta) = (r, \theta \pm 2\pi) \text{ or } (r, \theta) = (r, \theta \pm 360^\circ) \]
\[ (r, \theta) = (-r, \theta \pm \pi) \text{ or } (r, \theta) = (-r, \theta \pm 180^\circ) \]

\[ x = r \cos \theta \quad \theta = \tan^{-1} \frac{y}{x} \text{ if } (x,y) \text{ in Quad 1 or 4} \]
\[ y = r \sin \theta \]
\[ x^2 + y^2 = r^2 \quad \theta = \tan^{-1} \frac{y}{x} + \pi \text{ if } (x,y) \text{ in Quad 2 or 3} \]
\[ r = \sqrt{x^2 + y^2} \]

\[ \|v\| = \sqrt{a^2 + b^2} \quad u = \frac{v}{\|v\|} \quad v = \|v\| \cos \theta \mathbf{i} + \|v\| \sin \theta \mathbf{j} \]
\[ \theta = \tan^{-1} \left( \frac{b}{a} \right) \text{ if the resultant vector is quadrant 1 or 4.} \]
\[ \theta = \tan^{-1} \left( \frac{b}{a} \right) + 180^\circ \text{ if the resultant is in quadrant 2 or 3.} \]

\[ (\text{a}) \quad (y-k)^2 = 4a(x-h) \]
\[ (\text{b}) \quad (y-k)^2 = -4a(x-h) \]
\[ (\text{c}) \quad (x-h)^2 = 4a(y-k) \]
\[ (\text{d}) \quad (x-h)^2 = -4a(y-k) \]

\[ \frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1 \quad \text{or} \quad \frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1 \]

Asymptotes: \( y-k = \pm \frac{b}{a} (x-h) \)
Vertices: \((h \pm a, k)\), Foci: \((h \pm c, k)\)

Asymptotes: \( y-k = \pm \frac{a}{b} (x-h) \)
Vertices: \((h, k \pm a)\), Foci: \((h, k \pm c)\)
## MATH 127 TEST 3 REVIEW PROBS

<table>
<thead>
<tr>
<th>Section</th>
<th>Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.4</td>
<td>#17 – 20, 55 – 60, 61 – 66, 93 – 96 (Find magnitude and direction of resultant)</td>
</tr>
<tr>
<td>10.1</td>
<td>#13 – 20, 23 – 30, 33 – 38 (also find length of major and minor axis, eccentricity)</td>
</tr>
<tr>
<td>10.2</td>
<td>#13 – 18, 23 – 26, 33 – 38 (and transverse, conjugate, eccentricity)</td>
</tr>
<tr>
<td>10.3</td>
<td>#27 – 34, 35 – 38, 45 – 50 (find focus, focal width, vertex, directrix)</td>
</tr>
<tr>
<td>10.6</td>
<td>#11 – 24</td>
</tr>
</tbody>
</table>

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.