Math 104. **Unit 4 review worksheet.** **Fall 2011.**

You should attempt the following sample problems. Others may be found on the listed textbook pages.

Since you will not have time to attempt all of these exercises during the workshop, you may like to focus on the following shorter list of topics that I believe were the most challenging for students in Unit 4:

∘ solving triangles with either 0, 1, or 2 solutions – i.e. the ambiguous case SSA (6.1)
∘ understanding the standard forms of the conic sections (9.1, 9.2, 9.3),
∘ plotting parametric equations and parametrizing rectangular equations (9.5).

Section 6.1.
Exercises: pg's. 414-416.
Topics: Law of Sines, solving oblique triangles of the form AAS, ASA, and SSA.
Sample problems:

1. Use the Law of Sines to solve each of the following triangles:
   (i) $A = 24.3°$, $C = 54.6°$, $c = 2.68$.
   (ii) $A = 58°$, $a = 11.4$, $b = 12.8$.
   (iii) $A = 76°$, $a = 18$, $b = 20$.
3. Look at word problems 25-34, on pg's 414-415.

Section 6.2.
Exercises: pg's. 421-423.
Topics: Law of Cosines, solving oblique triangles of the form SSS and SAS.
Sample problems:

1. Use the Law of Cosines to solve each of the following triangles:
   (i) $A = 50°$, $b = 15$, $c = 30$.
   (ii) $a = 1.42$, $b = 0.75$, $c = 1.25$.
2. Look at word problems 37-44, on pg. 422.

Section 9.1.
Exercises: pg's. 667-670.
Topics: Introduction to conic sections, standard form of equations of circles and parabolas.
Sample problems:

1. Find the standard form of the equation of the circle centered at $(3, 7)$ that passes through the point $(1, 0)$.
2. Identify the center and radius of the circle whose equation is $(x + 9)^2 + (y + 1)^2 = 36$.
3. Write the equation of the circle $9x^2 + 9y^2 + 54x - 36y + 17 = 0$ in standard form. Then identify its center and radius as well as the x- and y- intercepts of its graph, if they exist.
4. Find the standard form of the equation of the parabola with vertex at the origin and the following additional characteristic (there are two distinct problems below):
   (i) Focus: $(-2, 0)$.
   (ii) Directrix: $x = -3$.
5. Find the vertex, focus, and directrix of the parabola $y^2 + 6y + 8x + 25 = 0$. Use this information to sketch its graph by hand.
6. Find the standard equation of the parabola with focus $(2, 2)$ and directrix $x = -2$.
7. Look at word problems 90-95, on pg. 669.

Section 9.2.
Exercises: pg's. 677-679.
Topics: Standard form of equations of ellipses.
Sample problems:

1. Find the center, vertices, and foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{81} = 1$.
2. Find the standard form of the equation of the ellipse $12x^2 + 20y^2 - 12x + 40y - 37 = 0$. Then identify its center, vertices, and foci, and sketch its graph by hand.
3. Find the standard form of the equation of the ellipse with the given characteristics:

(i) Vertices: $(0, \pm 8)$; foci: $(0, \pm 4)$.
(ii) Vertical major axis; passes through points $(0, 4)$ and $(2, 0)$.
(iii) Foci: $(0, 0)$, $(4, 0)$; major axis of length 6.

4. Look at word problems 47-53, on pg. 678.

Section 9.3.
Exercises: pg's. 687-689.
Topics: Standard form of equations of hyperbolas.
Sample problems:

1. Find the center, vertices, foci, and asymptotes of the hyperbola $\frac{y^2}{9} - \frac{x^2}{1} = 1$.
2. Find the standard form of the equation of the hyperbola $9x^2 - y^2 + 54x + 10y + 55 = 0$. Then identify its center, vertices, foci, and asymptotes, and sketch its graph by hand.
3. Find the standard form of the equation of the hyperbola with the given characteristics:
   (i) Vertices: $(0, \pm 2)$; foci: $(0, \pm 4)$.
   (ii) Foci: $(\pm 1, 0)$; asymptotes: $y = \pm 5x$.
   (iii) Vertices: $(-2, 1), (2, 1)$; passes through the point $(5, 4)$.

Section 9.5.
Exercises: pg's. 704-706.
Topics: Intro to parametric equations, parametrizing rectangular equations, eliminating the parameter in parametric equations, graphing simple parametric equations.
Sample problems:

1. Sketch the curve represented by the parametric equations $x = 3 - 2t$, $y = 2 + 3t$. Then eliminate the parameter and write the corresponding rectangular equation whose graph represents the curve. Adjust the domain of the rectangular equation if necessary.
2. Use a calculator to sketch the graph of $x = t/2$, $y = \ln(t^2 + 1)$.
3. Find two different sets of parametric equations for the rectangular equation $y = x^3 + 2x$.

Section 9.6.
Exercises: pg's. 711-712.
Topics: Intro to polar coordinates, multiple representations of points in the polar coordinate system, converting between rectangular and polar coordinates.
Sample problems:

1. Plot the point given in polar coordinates by $\left(-1, -\frac{2\pi}{3}\right)$. Then find two additional polar representations, and find the corresponding rectangular coordinates.
2. Convert the polar equation $r = -3\csc\theta$ to rectangular form.
3. Convert the rectangular equation $3x - 6y + 2 = 0$ to polar form.

Section 9.7.
Exercises: pg's. 720-721.
Topics: Graphing polar equations, testing polar equations for symmetry, graphing using symmetry.
Sample problems:

1. Test the following polar equations for symmetry with respect to $\theta = \pi/2$, the polar axis, and the pole.
   (i) $r = 12\cos(3\theta)$.
   (ii) $r^2 = 25\cos(4\theta)$.
2. Sketch the graph of the polar equation $r = 4 + 5\sin\theta$. Use symmetry if possible.