The final exam is comprehensive. The reviews for the first and second midterms (found here) can be used as review for the final exam. This review includes problems only from chapter 11 (on parametrizations and polar coordinates) and complex numbers.

Do not assume that the final exam problems will be similar to any of the problems below or those found in the first two reviews. Your final may contain questions that do not resemble any of the questions on these reviews.

**Textbook Problems**

Completing all WebAssign assignments is not sufficient preparation for the final. In particular, you will need to show all necessary steps on the exam, not just give an answer. It is strongly recommended that you work out all textbook problems listed on the department’s Math 152 website.

**Additional Review Problems**

1. Find a rectangular equation for the curve given by the parametric equations and identify the direction of motion.
   - a) \( x = 3 \cos(2t) \) \( y = 1 + \cos^2(2t) \)
   - b) \( x = (\sin t)^2 \) \( y = 2 - \cos t \)

2. Find an equation of the tangent line to the curve given by the parametric equations
   \( x = t \cos t, \ y = t \sin t \) at \( t = \pi/2 \).

3. Find the arc length of the parametric curve
   \( x = 6t - 6 \sin t, \ y = 6 - 6 \cos t \) for \( 0 \leq t \leq 2\pi \).

4. Find the surface area obtained by rotating the parametric curve
   \( x = 1 - \cos t, \ y = t - \sin t, \ [0, \pi/2] \)
   about the \( x \)-axis.

5. Consider the curve given by \( r = 8 \sec \theta \).
   - a) Find an equation in rectangular coordinates for this curve.
   - b) Find the arc length of this curve for \( -\pi/4 \leq \theta \leq \pi/4 \).

6. Find an equation in polar coordinates for the circle \((x - 2)^2 + (y + 1)^2 = 5\).

7. Find the area of the intersection of the circles \( r = \sin \theta \) and \( r = \cos \theta \).

8. Consider the polar curves \( r = 3 + 2 \sin \theta \) and \( r = 2 \).
   - a) Find the coordinates of the points of intersection of the two curves.
   - b) Find the area that lies inside \( r = 3 + 2 \sin \theta \) and outside \( r = 2 \).
9. Find the area of the region inside the circle \( r = 2 \) and to the right of the line \( r = \sec \theta \).

10. Let \( r_1 \) and \( r_2 \) be the complex roots of \( x^2 - 4x + 13 = 0 \). Find \( r_1 \) and \( r_2 \) and evaluate \( r_1^2 + r_2^2 \). Write your answer in simplest form.

11. Write \((\sqrt{3} + i)^{50}\) in exponential and in Cartesian form.

12. Express the complex number in standard and exponential form.

   a) \( \left( \frac{1}{\sqrt{2}} + i \cdot \frac{1}{\sqrt{2}} \right)^4 \)

   b) \( \frac{1}{\cos(n\theta) + i \sin(n\theta)} \)

   c) \( \frac{4i}{(1 + 2i)^2} \)

   d) \( \frac{\cos(2\theta) + i \sin(2\theta)}{\cos(3\theta) + i \sin(3\theta)} \)

13. Find the quadratic equation that has roots \( 2 \pm \sqrt{3}i \).

14. Let \( z = 1 + i \) and \( w = \sqrt{3} + i \). Write the complex number in polar form.

   a) \( z \)

   b) \( zw \)

   c) \( w^2 \)

   d) \( \frac{z}{w} \)

15. Find all complex numbers \( z \) that satisfy the equation. Write your solutions in rectangular form.

   a) \( z^3 = 8i \)

   b) \( (z + i)(1 - i) = 2 + 3i \)

   c) \( (z + 1)^4 = 16 \)

   d) \( z^3 = -27i \)

   e) \( e^{iz} = 3i \)