

**Math 121 Review, Practice Problem Set 3**  
**(Based on Chapter 6 and 7)**

1. Identify the curve  $x = \cos t + \sin t$ ,  $y = \cos t - \sin t$ .
2. How much distance do you cover if you move from  $(1, 4)$  to  $(e^2 - 2, 4e)$  along the path  $x = e^t - t$ ,  $y = 4e^{t/2}$ ?  
(Answer:  $e^2 + 1$ )
3. Find the area of one of the larger loops of the curve  $r = 1 + 2 \cos 2\theta$ .  
(Answer:  $\pi + 3\sqrt{3}/4$ )
4. A barrel has the shape of a solid of revolution obtained by rotating about its major axis the part of the ellipse lying between the lines through its foci and perpendicular to that axis. The barrel is 4 feet high and 2 feet in radius at its middle. What is its volume?  
(Answer:  $40\pi/3$  cubic feet)
5. One leaf of the lemniscate  $r^2 = \cos 2\theta$  is rotated about the  $x$ -axis. Find the area of the surface generated.  
(Answer:  $(2 - \sqrt{2})\pi$  square units)
6. A dam 200 m long and 24 m high presents a sloping face of 26 m slant height to the water in the reservoir behind the dam. If the surface of the water is level with the top of the dam, what is the force of the water on the dam?  
(Answer:  $6.12 \times 10^8$  N)