Math 1B **Name (Print):** ______________________

Spring 2017

Chapters 8 & 10 Test **Due 5/4/17**

Write all responses on separate paper. Show your work in detail for credit. Do not copy other's work.

1. (16 points) Consider the curve defined by the parametric equations

$$x = \sin^3(t)$$
$$y = \cos(t)$$

   (a) Complete the table of values and extend it as needed to sketch a complete graph for the the curve in the xy-plane.

t	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
x					
y					

   (b) Find the coordinates of the points of inflection.

2. (16 points) Consider the parametric equations,

$$x(t) = \int_0^t \cos(u^2)\,du, \qquad y(t) = \int_0^t \sin(u^2)\,du$$

   (a) Find the the arclength of this curve over the interval from $t \in [0, s]$.

   (b) For what values of t is the line tangent to the curve vertical?

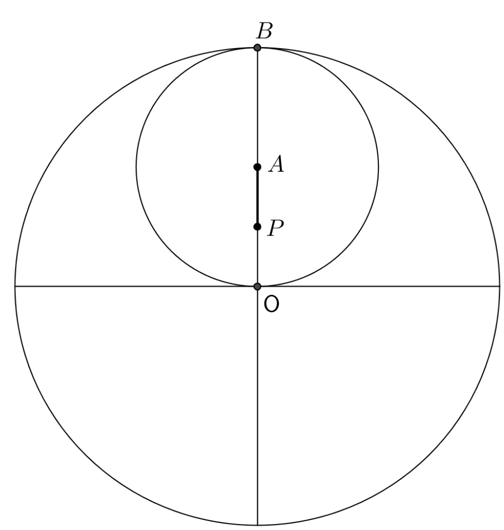
3. (16 points) Consider the parametric equations

$$x(\theta) = 2\tan\theta$$
$$y(\theta) = 2\cos\theta$$

   (a) Make a table of values and sketch a graph for the curve.

   (b) Set up and simplify an integral for the surface area generated when the part of the curve $t \in \left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$ is revolved about the x-axis.

4. (20 points) In the diagram, a circle of radius $OA = 2$ rolls around the inside of a circle of radius $OB = 4$ with the half radius $AP = 1$ originally positioned so that P is on OB. Find a parameterization for the path that P traces out as the inner circle rolls (without slipping.) Start by choosing an appropriate parameter. Is that a familiar curve?



5. (16 points) Find the area enclosed by one of the loops in the graph of the polar function $r = 2\sin\theta - \tan\theta$.

6. (16 points) Use Simpson's rule with $n = 6$ to approximate the arc length of $r = \cos(4\cos(\theta))$ on the interval $t \in \left[0, \frac{\pi}{2}\right]$.