Math 202
Hour Exam 2

Name: _____ Date: _____

9 Problems. 100 Points. Follow directions carefully. Please do not leave any question blank, and turn off cell phones and other noisemakers to avoid disturbing your classmates.

I have verified that this exam contains 9 problems and 6 printed pages. Initial_____.

Print the name of the people sitting either side of you :- _____

Short Answer (8 points each) - no explanation or calculations necessary though where appropriate, answers should be exact. Print your answers to each question in the appropriate numbered box below.

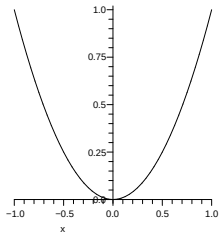
1. Write down parametric equations for a circle of radius 3 centered at the point $(2, 1)$.

2. Find the general solution to the differential equation

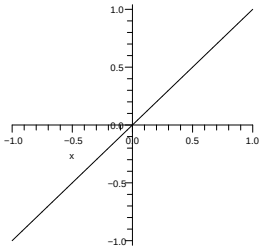
$$\frac{dy}{dx} = y^2 x^2.$$

3. Set up but **do not evaluate** an integral to evaluate the arc length of the curve $x = y + y^3$ where $1 \leq y \leq 4$.

4. The graphs of the parametric equations $x(t)$ and $y(t)$ of the position of a particle P at time t are drawn below. Sketch a graph of the curve C traversed by the particle for $-1 \leq t \leq 1$ (a rough sketch is acceptable).



$x(t)$



$y(t)$

5. Set up but **do not evaluate** an integral to find the surface area of the volume obtained by rotating $y = \cos(2x)$ about the x-axis.

6. (a) If a point has Cartesian coordinates $(1, 1)$, what are its polar coordinates?

   (b) If a point has polar coordinates $(1, 1)$, what are its Cartesian coordinates?

Long Answer (18 points each) - show work and provide explanations, an answer without supporting work is not worth much.

1. Derive the formula for the surface area of a sphere of radius R by realizing it as the solid of revolution obtained by rotating the curve

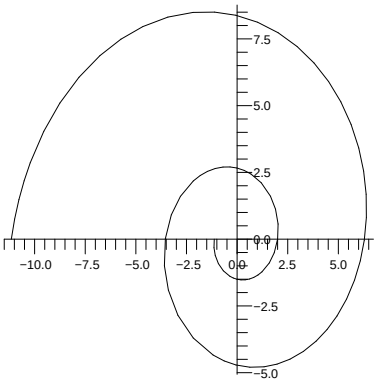
$$y = \sqrt{R^2 - x^2}$$

about the x-axis.

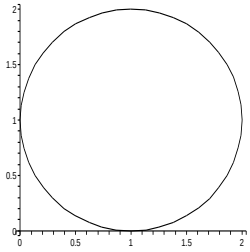
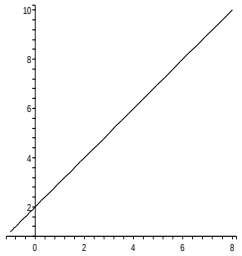
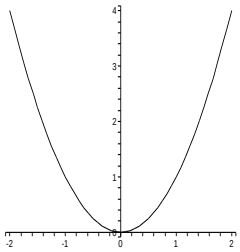
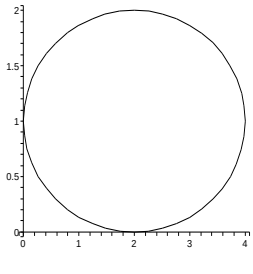
2. Find the arc length of the logarithmic spiral with equation

$$r = 2 * (1.2)^{\theta}$$

for $-\pi \leq \theta \leq 3\pi$ as illustrated below.



3. Match the curve with the correct parameterization (with brief reasons). **Be warned**: the x and y-axis may have different scales.

Parameterization	Graph
a) $x(t) = t$, $y(t) = t^2$	i) 
b) $x(t) = t$, $y(t) = \sin(t)$	ii) 
c) $x(t) = t^2 - 1$, $y(t) = t^2 + 1$	iii) 
d) $x(t) = 1 + \cos(t)$, $y(t) = 1 + \sin(t)$	iv) 
e) $x(t) = t$, $y(t) = t^2$	v)