

Name: _____

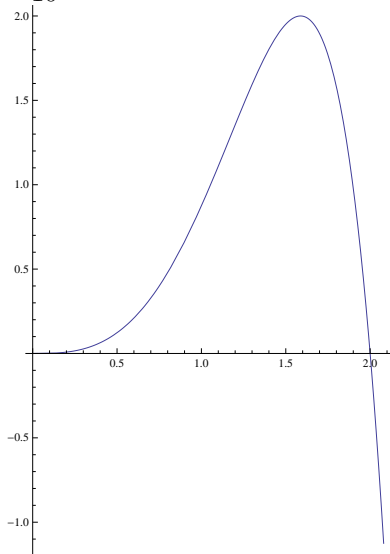
Calculus III
Math 143 Winter 2009
Professor Ben Richert
Exam 2
March 3, 2009

Please do all your work in this booklet and remember, unless otherwise specified, an answer without English is incorrect. Calculators are not allowed, but you may use one side of a 3x5 card on which you have recorded equations or formulas. Put your name on your card and turn it in with your exam.

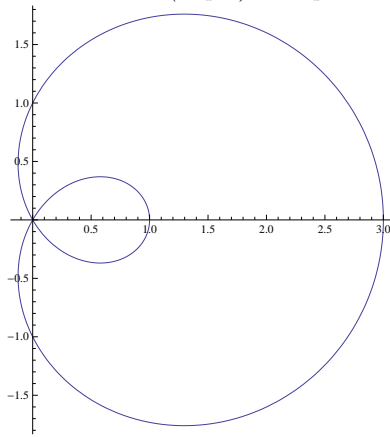
Problem	Possible points	Score
1	10	
2	10	
3	10	
4	10	
5	20	
6	8	
Total	68	

Problem 1. (10pts) At what points (x, y) is the tangent line to the parametric curve $x(t) = t^2 + t + 1$, $y(t) = \frac{t^3}{3} - \frac{3t^2}{2} + 2t + 1$ horizontal?

Problem 2. (10pts) Give an integral which computes the area above the x -axis and below the curve $x(t) = \sqrt[3]{t}$, $y(t) = -\frac{1}{10}(t^2 - 8t)$ for $t \geq 0$. You do not need to evaluate this integral.



Problem 3. (10pts) Compute the area inside inner loop of the polar curve $r(\theta) = 1 + 2\cos(\theta)$.



Problem 4. (10pts) Suppose a wrench one foot long lies along the y -axis and grips a bolt at the origin. A exceedingly large man applies a force of 100 pounds in the direction $\langle \sqrt{3}, 1, 0 \rangle$ (which, by the way, points 30° degrees off the horizontal). What is the magnitude of the torque on the bolt?

Problem 5. (20pts) Consider the point $(1, 2, 3)$, the line $\vec{r}(t) = \langle 3 + t, 2 - t, 1 + 2t \rangle$, and the plane $2x + y - z = 2$.
(a-10pts) Compute the distance from the point $(1, 2, 3)$ to the plane $2x + y - z = 2$.

(b-10pts) What is the equation of the plane which contains the point $(1, 2, 3)$ and the line $\vec{r}(t) = \langle 3 + t, 2 - t, 1 + 2t \rangle$?

Problem 6. (8pts) Match the following graphs with their equations. You do not need to show any work for this problem.

Equation	Graph
(A) $r = 1 + 2 \cos(4t)$	
(B) $r = 1 + 4 \cos(2t)$	
(C) $x(t) = \sqrt{t} + \cos(t); y(t) = \sin(t)$	
(D) $x(t) = t + \cos(t); y(t) = t$	

