Math 53 Homework 1

Due Tuesday 9/6/11 in section

Please note:

• Homework assignments for this class can be lengthy, but a lot of practice solving problems is essential for learning the material. Be organized, and don't leave things for a marathon session on Monday night. Get a good start on the homework over the weekend (or even earlier!).

• You may check your answers to odd-numbered problems in the back of the book, but you need to turn in solutions, not just answers. You may discuss the homework problems with your classmates, but **you must write your solutions on your own**. I am aware that it is not hard to find solutions manuals on the internet. Copying said solutions on a homework assignment will result in a negative grade for that assignment. (It also won't help you learn the material).

• The problems in parentheses are for extra practice and **optional**. You only need to turn in the underlined problems.

• Bonus problems are harder and worth a small amount of extra credit. You're better off starting with the regular problems first.

Friday 8/26 – Parametric equations

- **Read:** sections 10.1, 10.2 to top of p. 635.
- Work: 10.1: (9), <u>11</u>, <u>13</u>, (19), (21), (24), <u>31</u>, <u>33</u>, (37), (41), <u>45</u>.
 10.2: (3), <u>7</u>, (17), <u>19</u>, (25), (31), <u>33</u>, <u>41</u>, (43), (51), (53), <u>73</u>.
 <u>Problem 1</u> below (next page).

Monday 8/29 – Polar coordinates

- **Read:** section 10.3.
- Work: 10.3: (11), <u>17</u>, <u>19</u>, (25), <u>29</u>, <u>30</u>, (31), (37), (51), <u>53</u>, <u>63</u>, (69), (77).

Wednesday 8/31 – Polar coordinates continued

- **Read:** section 10.4.
- Work: 10.4: (5), $\underline{7}$, $\underline{23}$, (31), $\underline{35}$, (41), $\underline{45}$, (47).
- Bonus problem (extra credit, hard): p. 672 problem 4.

Friday 9/2 – Vectors, dot product

- **Read:** sections 12.1, 12.2, 12.3.
- Work: 12.1: (5), (7), (11), <u>13</u>, (21), (27), <u>31</u>, <u>39</u>.
 - 12.2: (3), (5), (15), (17), (23), (25), $\underline{29}$, (31), (37), $\underline{39}$, $\underline{45}$.

Problem 1. One circle has radius a and center at the origin. A second circle of same radius a has a point P marked on it, which is initially at (a, 0). The second circle rolls without slipping counterclockwise around the first, until it has returned to its starting position.

a) Write parametric equations for the motion of P, using as parameter θ , the angle by which the contact point has turned.

(Note: first find the position of the center of the moving circle; then determine the distance and direction from the center to P. If you have trouble visualizing the problem, try it out experimentally with two coins).

b) Find the length of the trajectory of P. (Hint: the integrand simplifies to a constant times $\sqrt{2-2\cos\theta}$; use the half angle $\theta/2$ for further simplification.)