Midterm 2, Math 22, Fall 2008, 11/10/08

Instructions: Write your name and section number. Draw grading table on the cover. Read each problem carefully and follow all of its instructions. For each of the problems below, write a clear and concise solution in your blue book. Solutions must be simplified as much as possible, no full credit for partially completed problems. **Blue books with torn or missing pages will not be accepted !**

Some useful trigonometric identities:

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B \qquad \sin^2(\theta) = \frac{1}{2}(1 - \cos(2\theta))$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B \qquad \cos^2(\theta) = \frac{1}{2}(1 + \cos(2\theta))$$

1. Sequence is defined by $a_1 = 10$, $a_{n+1} = \frac{1}{2}(a_n + 2)$
    a. Write out first four terms of the sequence. (**5 pts**)
    b. Assuming that the limit exists, find the $\lim_{n \to \infty} a_n$ (**5 pts**)

2. Find the tangent line to $x = \sec(t)$, $y = 2\sin(t)\cos(t)$ at $\left(\frac{2}{\sqrt{3}}, \frac{\sqrt{3}}{2} \right)$ (Note: You must give the equation of the line) (**10 pts**)

3. Find the volume of revolution when region bounded by $y = \frac{1}{x}$, $x \geq 1$ and y=0 is revolved around the x-axis. (**10 pts**)

4. A laser is cutting a sheet of plastic along the arc described by $y = \frac{1}{3}x^{3/2}$ from x = -4 cm to x = 32 cm. If the laser spot is moving at 0.5 cm/sec, calculate the time it takes to complete the cut. (**10 pts**)

5. A metal plate has a shape bounded by polar curve $r = 2 + \sin(\theta)$ where r is in centimeters

    a. What type of symmetry does the plate possess? Prove this. (**3 pts**)
    b. Sketch the shape of the plate (**3 pts**)
    c. Find the area of the plate. (**4 pts**)