NAME:

Mid Term Exam II
Math 22—Spring 2009, Dummit

DIRECTIONS: This is a 1-hour exam. There are a total of 10 problems on this exam, *in no particular order*, with points as indicated, for a total of 100 points. Indicate your answers CLEARLY and NEATLY for partial credit.

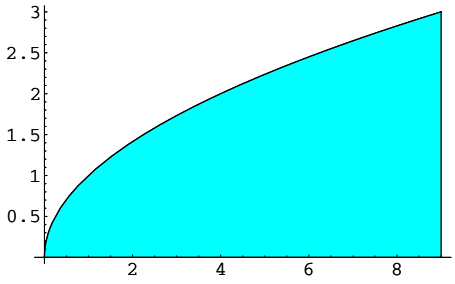
1. (10) Use the substitution $x+1=u^2$ to evaluate the integral $\displaystyle\int \frac{dx}{x\sqrt{x+1}}$.

2. (10) Evaluate the integral $\displaystyle\int \frac{2x+1}{x^2+2x+5}\,dx$.

3. (10) Determine whether the improper integral $\int_0^\infty xe^{-x}dx$ converges, and if it does determine its value.

4. (10) The widths (in meters) of a kidney-shaped swimming pool were measured at 2-meter intervals as indicated in the figure. Use Simpson's rule to estimate the area of the pool.

5. (a) (10) Find the exact coordinates of the centroid of the region bounded by the curves $y = \sqrt{x}$, $y = 0$ and $x = 9$, as in the diagram.

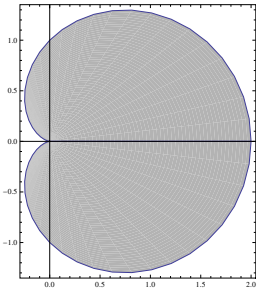


(b) (5) Use Pappus' Theorem and your answer to (a) to find the volumes of the solids obtained by rotating this region around (i) the x-axis, and (ii) the y-axis.

6. (10) Find the length of the curve $y = \ln(\sec x)$, $0 \leq x \leq \pi/4$.

7. (5) Write down, but do not bother to evaluate, an integral giving the surface area of the surface obtained by rotating the curve $y = e^{2x}$ from $x = 0$ to $x = 3$ around the x-axis.

8. (10) Determine the area enclosed by the cardioid $r = 1 + \cos\theta$ as shown:



9. (10) Find the arclength of the curve defined parametrically by $x = 1 + 3t^2$, $y = 4 + 2t^3$, for $0 \leq t \leq 1$.

10. (10) Find the points on the curve defined parametrically by $x = 10 - t^2$ and $y = t^3 - 12t$ where the tangent is (a) horizontal, or (b) vertical.