CALCULUS I — FINAL EXAM PRACTICE PROBLEMS
FALL 2007

1. A particle travels in a straight line with velocity at time t given by $v(t) = t^2 - 3t + 2$. Find the net distance and the total distance traveled by the particle from $t = 0$ to $t = 3$.

Answers: 3/2 and 11/6

2. The base of a solid is the region in the xy-plane bounded by the parabola $y = x^2$ and the line $y = 1$. Find the volume of this solid if every cross section perpendicular to the y-axis is an equilateral triangle with its base in the xy-plane.

Answer: $\sqrt{3}/2$

3. Find the volume of the solid obtained by revolving the region bounded by the circle $(x - a)^2 + y^2 = r^2$ $(r \leq a)$ about the y-axis. Sketch this solid.

Answer: $2\pi^2 r^2 a$

4. Find the length of the portion of the curve $(y - 1)^3 - (x + 1)^2 = 0$ from $(-1, 1)$ to $(7, 5)$.

Answer: $\dfrac{8}{27}\left(10^{3/2} - 1\right)$

5. The portion of the graph of $x = 1 + 2y^2$ from $y = 1$ to $y = 2$ is rotated about the x-axis. Find the area of the resulting surface.

Answer: $\dfrac{\pi}{24}\left(65^{3/2} - 17^{3/2}\right)$

6. A cylindrical tank of length 40 ft and radius 5 ft rests on its side. If the tank is mounted 4 feet above the ground how much work is done in pumping the tank full of oil (with density $\rho = 50$ lb/ft^3) if the oil is pumped in from ground level?

Answer: 450000π ft lb