MA 234-01 §15.1–16.3	**Test #2**	*score*	**Name:** _____ **23 May 1997**

1. Evaluate $\iint_R y \sin^2 x \, dA$ where R is the region in the first and second quadrants of the xy-plane below the curve $y = \cos x$ between $x = -\frac{\pi}{2}$ and $x = \frac{\pi}{2}$. *(16 points)*

2. Find the volume of the solid in 3-space which is below the surface $z = xy$ and above the region in the xy-plane bounded by the curves $y = \sqrt{x}$ and $y = x^2$. *(16 points)*

3. Find the moment of inertia about the z-axis of a sphere of radius 1 centered at the origin if the mass density at any point in the ball is given by $\rho(x, y, z) = \sqrt{x^2 + y^2}$. *(16 points)*

4. A square in the xy-plane with vertices $(2, 2)$, $(4, 0)$, $(6, 2)$, and $(4, 4)$ is revolved about the y-axis. Find the volume of the resulting solid of revolution. *(16 points)*

5. Find the volume of the solid in 3-space under the surface $z = 16 - x^2 - y^2$ and above the xy-plane. *(16 points)*

6. Let $\vec{r}(t) = (3\cos(2t), 3\sin(2t), 4t)$ for $0 \le t \le 2\pi$.

   (a) Compute the arclength of the curve from $t = 0$ to $t = \pi$. *(10 points)*

   (b) Show that the acceleration vector is always parallel to, but in the opposite direction as, the first two components of the location vector $\vec{r}(t)$. *(10 points)*