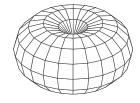
Name	ID	
MATH 251	Quiz 6	Fall 2005

Multiple Choice: (5 points each)

1-2	/10
3	/10
4	/10
Total	/30

1. (5 points) Which of the following integrals will give the volume of the donut given in spherical coordinates by $\rho = \sin \varphi$.



a.
$$\int_0^{2\pi} \int_0^{\pi} \int_0^{\sin \varphi} \rho^2 \sin \varphi \, d\rho \, d\varphi \, d\theta$$

b.
$$\int_0^\pi \int_0^{2\pi} \int_0^{\sin\varphi} \rho^2 \cos\varphi \, d\rho \, d\varphi \, d\theta$$

c.
$$\int_0^\pi \int_0^{2\pi} \int_0^1 \sin\varphi \, d\rho \, d\varphi \, d\theta$$

d.
$$\int_0^{2\pi} \int_0^{\pi} \int_0^1 \sin\varphi \, \rho^2 \cos\varphi \, d\rho \, d\varphi \, d\theta$$

$$e. \int_0^\pi \int_0^{2\pi} \int_0^{\sin\varphi} 1 \,d\rho \,d\varphi \,d\theta$$

2. (5 points) A mass is pushed along the curve $\vec{r}(t) = (t^2, t^3)$ by the force $\vec{F} = (y, x)$ from the point (0,0) to the point (4,8). Find the work done by the force.

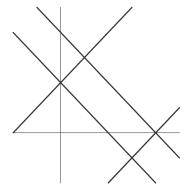
P. Yasskin

a. 2

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- **b.** 4
- **c.** 8
- **d.** 16
- **e.** 32

3. (10 points) Compute $\iint (x+y) dx dy$ over the region bounded by the lines y=x-2, y=x+1, y=1-x, and y=2-x.



Use curvilinear coordinates.

Half credit for rectangular coordinates.

4. (10 points) The temperature in a box is T = 100xyz°C. A wire temperature probe has the shape of the curve $\vec{r}(t) = \left(t, t^2, \frac{2}{3}t^3\right)$ for $0 \le t \le 1$. Find the average temperature along the probe given by $T_{\text{ave}} = \frac{\int T ds}{\int ds}$. HINT: Factor inside the square root.