

40 pts. **Problem 1.** Use Lagrange Multipliers to find the max and min of the function  $f(x, y) = xz + y$  on the sphere  $x^2 + y^2 + z^2 = 3$ .

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40 pts. **Problem 2.** Let  $D$  be the region in the  $xy$ -plane bounded by the curve  $y = 1 - x^2$  and the line  $y = 1 + x$ . Find the area of  $D$  and  $\bar{y}$ , the  $y$ -coordinate of the centroid of  $D$ . Evaluate the integrals by hand computation.

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40 pts. **Problem 3.** Consider the integral

$$\int_0^1 \int_1^{2-x^2} f(x, y) dy dx.$$

Sketch the region of integration and find an equivalent iterated integral with the order of integration reversed.

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60 pts. **Problem 4.** Let  $D$  be the solid in the first octant bounded by the coordinate planes, the plane  $y = 1$  and the plane  $x + z = 1$ .

A. Find an iterated integral for calculating

$$\iiint_D y dV$$

where the first integration is with respect to  $y$ . (Don't do the integral yet.)

B. Find an iterated integral for calculating

$$\iiint_D y dV$$

where the first integration is with respect to  $x$ . (Don't do the integral yet.)

C. Evaluate one of these integrals by hand computation.

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40 pts. **Problem 5.** Let  $D$  be the solid bounded below by the paraboloid  $z = 2(x^2 + y^2)$  and above by the plane  $z = 2$ . Find the moment of inertia of the solid for rotation about the  $z$ -axis. (Assume the density is  $\delta = 1$ ).  
Use cylindrical coordinates.

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40 pts. **Problem 6.** Let  $D$  be the solid hemisphere bounded above by the sphere  $x^2 + y^2 + z^2 = a^2$  and below by the plane  $z = 0$ . Calculate  $\bar{z}$ , the  $z$  coordinate of the centroid of  $D$ .  
Use spherical coordinates.

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# EXAM

Exam 2

Math 2350–14, Fall 2008

Thursday, November 13, 2008

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- Write all of your answers on separate sheets of paper. You can keep the exam questions when you leave. You may leave when finished.
- You **must** show enough work to justify your answers. Unless otherwise instructed, give exact answers, not approximations (e.g.,  $\sqrt{2}$ , not 1.414).
- This exam has 6 problems. There are **260 points total**.

Good luck!