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 parabaloid $z = 2(x^2 + y^2)$ 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.

EXAM

Exam 2

Math 2350–14, Fall 2008

Thursday, November 13, 2008

- 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!