CALCULUS III NAME ____________________

EXAM III Rec. Instr. ____________________

FALL 1997 Rec. Time ____________________

TO RECEIVE CREDIT YOU MUST SHOW YOUR WORK.

(10) 1. Find the volume of the 3-dimensional region which is under the surface $z = 1 + xy$ and above the rectangle $0 \le x \le 2$, $0 \le y \le 3$ in the xy plane.

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(15) 2. Find the volume of the 3-dimensional region which is enclosed by the surfaces $y = x^2$, $y = 2x$, $z = y$ and $z = 6$.

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(10) 3. Evaluate $\int_0^2 \int_{x^2}^4 2x\cos(y^2)\,dy\,dx$ by **first reversing the order of integration**.

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(15) 4. A mass distribution occupies the region which is enclosed by the surfaces $z = 2 - x^2 - y^2$ and $z = x^2 + y^2$. The mass density function is $\delta(x, y, z) = 2z$ units of mass/unit volume. Calculate the total mass.

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(15) 5. A mass distribution occupies the region which is above the surface $z = \sqrt{x^2 + y^2}$ and under the plane $z = 2$. The mass density function is $\delta(x, y, z) = z\sqrt{x^2 + y^2 + z^2}$ units of mass/unit volume. Use a triple integral in **spherical coordinate** to calculate the total mass.

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(15) 6. Find the surface area of that part of the surface $z = y^2$ which is in the first octant and is above the region of the xy plane bounded by the lines $y = x$, $y = 2$ and $x = 0$.

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(20) 7. The force field $\vec{F} = xy\,\vec{i} + x^2\vec{j}$ acts on an object as it is moved in the plane. Find the work done by $\underline{F}$ as the object moves from (0,0) to (4,1) along the curve which is the parabola $y = x^2$ from (0,0) to (1,1) followed by the line segment from (1,1) to (4,1).