CALCULUS III NAME _____

EXAM III Rec. Instr. _____

SPRING 1999 Rec. Time _____

TO RECEIVE CREDIT YOU MUST SHOW YOUR WORK.

(15) 1. Find the volume of the 3 dimensional region under $z = 1 + x$ and above the region of the xy-plane which is bounded by the curves $x = 0$, $y = 4$ and $y = x^2$.

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

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(10) 3. Evaluate $\int_0^4 \int_{\sqrt{x}}^2 \frac{1}{1+y^3}\, dy\, dx$ by first **reversing the order of integration**.

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(15) 4. A mass distribution occupies the 3 dimensional region which is above $z = x^2 + y^2$ and below the plane $z = 4$. If the mass density function is $\delta = \sqrt{x^2 + y^2}$ units of mass/unit volume, calculate the total mass.

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(15) 5. A mass distribution occupies the 3 dimensional region which is above the cone $z = \sqrt{x^2 + y^2}$ and below the plane $z = 4$. If the mass density function is $\delta = z$ units of mass/unit volume, use a triple integral in **spherical coordinates** to calculate the total mass.

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(15) 6. Find the surface area of that part of the surface $z = 1 + x^2$ which lies above the region of the xy-plane which is enclosed by the curves $y = x$, $y = 0$ and $x = 2$.

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(15) 7. Calculate the surface area of the parametrized surface $x = \frac{1}{2}t^2$, $y = 2t$, $z = s$, $0 \le s \le 2$, $0 \le t \le 1$. Use a formula from the integral tables to evaluate the integral.