CALCULUS III NAME _____

EXAM III Rec. Instr. _____

SPRING 2002 Rec. Time _____

TO RECEIVE CREDIT YOU MUST SHOW YOUR WORK.

(15) 1) Find the volume of the 3D-region which is under $z = 2x + 2y$ and above the region in the first quadrant of the xy-plane that is bounded by the lines $y = 2x$, $y = 4$ and $x = 0$.

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(15) 2) Find the volume of the 3D-region which is enclosed by the paraboloids $z = 12 - x^2 - y^2$ and $z = 2x^2 + 2y^2$.

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(15) 3) Evaluate

$$\int_0^4 \int_{\sqrt{x}}^2 \frac{1}{\sqrt{1+y^3}}\, dy\, dx$$

by <u>first reversing the order of integration</u>.

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(25) 4) A mass distribution occupies the region which is above the paraboloid $z = x^2 + y^2$ and under the plane $z = 1$. If the mass density function is $\delta = 12z$ units of mass/units of volume, find the total mass and the z-coordinate of the center of mass.

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(15) 5. Use a triple integral in <u>spherical</u> <u>coordinates</u> to find the volume of the 3D-region which is above $z = \sqrt{x^2 + y^2}$ and inside the sphere $x^2 + y^2 + z^2 = 9$.

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(15) 6. <u>Find the area</u> of that part of the surface $z = x^2 + 2y$ which lies above the region in the first quadrant of the xy-plane that is bounded by the lines $y = x$, $y = 0$ and $x = 2$.