Instructions: Answer all problems. Show your work: even correct answers may receive little or no credit if a method of solution is not shown. Calculators, notes, cell phones, and other materials are not permitted.

Name. ______________________________

1. Evaluate the definite integral $\iint_R 2xy\ dA$ where R is the region bounded by the lines $y = 0$, $y = 2x$, and $x = 1$.

2. Evaluate the integral by first reversing the order of integration: $\displaystyle\int_0^2 \int_{\frac{y}{2}}^1 e^{x^2}\ dxdy$.

3. Find an integral expression for the moment M_x of the lamina with density 1 occupying the region between the parabolas $y = x^2$ and $y = 8 - x^2$. Do not evaluate the integral.

4. Find an integral expression for the volume of the solid under the surface $z = x^2 y$ and above the triangular region in the xy-plane with vertices $(0, 0)$, $(1, 0)$, and $(0, 1)$. Do not evaluate the integral.

5. Find the volume of the solid below the paraboloid $z = 9 - x^2 - y^2$, above the xy-plane, and outside the cylinder $x^2 + y^2 = 1$.

6. Find an integral expression in spherical coordinates for the moment M_{xz} of the solid inside the sphere $x^2 + y^2 + z^2 = 9$, outside the sphere $x^2 + y^2 + z^2 = 1$ and above $z = 0$. Do not evaluate the integral.

7. Let R be the part of a (solid) sphere of radius 1 in the first octant. Express the integral $\iiint_R z\, dV$ in Cartesian, Cylindrical, *and* Spherical coordinates.

8. The transformation $x = 2u$, $y = 3v$ transforms the half disk $D = \{(u, v) \mid u^2 + v^2 \leq 1, v \geq 0\}$ into the half ellipse $E = \{(x, y) \mid 9x^2 + 4y^2 = 36, y \geq 0\}$. Use this transformation to evaluate the integral $\iint_E y\, dA$. Hint: use another change of variables to polar coordinates.