(1) Convert the rectangular equation $4x^2 - z^2 = -4y^2$ into cylindrical coordinates.

(2) Evaluate the iterated integrals.

(a) $\int_1^3 \int_0^{\pi/2} x \sin y \, dy \, dx$  
(b) $\int_0^2 \int_0^{4-y^2} (x + y) \, dx \, dy$  
(c) $\int_0^1 \int_0^{2-y} \int_0^{2-x-y} xy \, dz \, dx \, dy$

(3) Evaluate the following iterated integrals. It will be necessary to either change the order of integration or to change coordinate systems.

(a) $\int_{-2}^2 \int_{\sqrt{4-y^2}}^{\sqrt{16 - x^2 - y^2}} 16 - x^2 - y^2 \, dx \, dy$  
(b) $\int_0^{\pi/2} \int_x^{\sqrt{\pi/2}} \int_1^3 \sin(y^2) \, dz \, dy \, dx$

(4) Write an iterated integral of a continuous function $f(x, y)$ over the region $R$ bounded by $y = 2x$, $y = 3x - 9$, and $y = 0$.

(5) Find the volume of the solid bounded by $z = x + y$, $z = 0$, $x = 0$, $x = 3$, and $y = x$.

(6) Find the volume of the solid bounded by the cylinder $f(x, y) = 9 - y^2$ and the $xy$-plane above the triangle bounded by $y = x$, $y = -x$, and $y = 3$.

(7) Suppose the upper half of the cone $z = \sqrt{x^2 + y^2}$ is removed from the hemisphere $z = \sqrt{4 - x^2 - y^2}$. Find centroid of the remaining solid assuming that the density of the solid is $\delta(x, y, z) = 1$.

(8) Use a transformation to compute $\iint_R (x - y)^2 \, dA$ on the interval shown in the graph below. Also graph the new region $S$ in the $uv$-coordinate grid.