Math 241 Homework 10: §15.7 cont'd

1. Convert the following spherical points into rectangular and cylindrical coordinates.

   (a) $(\rho, \phi, \theta) = (6, \pi/6, \pi/6)$

   (b) $(\rho, \phi, \theta) = (4, \pi/6, 7\pi/6)$

   (c) $(\rho, \phi, \theta) = (4, \pi/6, \pi/2)$

2. Set up triple integrals to find the volume of the following regions.

   (a) The solid bounded above by the sphere $\rho = 3$ and below by the cone $\phi = \pi/6$.

   (b) The solid within the sphere $x^2 + y^2 + z^2 = 4$, above the xy-plane, and below the cone $z = \sqrt{x^2 + y^2}$.

   (c) The solid inside the cone $z = \sqrt{(x^2 + y^2)/3}$, and between the spheres $x^2 + y^2 + z^2 = 4$ and $x^2 + y^2 + z^2 = 9$.

3. Rewrite the following integrals in spherical coordinates.

   (a) $\displaystyle\int_{-1}^{1} \int_{0}^{\sqrt{1-x^2}} \int_{0}^{\sqrt{1-x^2-y^2}} z(x^2 + y^2 + z^2)^{3/2}\, dz\, dy\, dx$

   (b) $\displaystyle\int_{0}^{3} \int_{0}^{\sqrt{9-x^2}} \int_{-\sqrt{9-x^2-y^2}}^{\sqrt{9-x^2-y^2}} x^2\, dz\, dy\, dx$

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