(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 $x = 0$. 
(15) 2) Find the volume of the 3D-region which is enclosed by the paraboloids 
\[ z = 12 - x^2 - y^2 \] and \[ z = 2x^2 + 2y^2. \]
(15) 3) Evaluate
\[ \int_0^4 \int_{\sqrt{x}}^{2} \frac{1}{\sqrt{1 + y^3}} \, dy \, dx \]
by first reversing the order of integration.
(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.
(15) 5. Use a triple integral in spherical coordinates to find the volume of the 3D-region which is above \( z = \sqrt{x^2 + y^2} \) and inside the sphere \( x^2 + y^2 + z^2 = 9 \). 
6. Find the area 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 $x = 2$. 