Calculus Exercises (12.7)

1. Convert the given rectangular coordinates of the point to spherical coordinates. (將直角座標轉換成球座標)
   
   (1) (3, 0, 0)  
   (2) (1, \sqrt{3}, 2\sqrt{3})  
   (3) (0, -1, -1)

2. Convert the given spherical coordinates of the point to rectangular coordinates. (將球座標轉換成直角座標)
   
   (1) (3, 0, 0)  
   (2) (2, \pi/3, \pi/3)  
   (3) (5, \pi, \pi/2)

3. Use spherical coordinates (球座標) to evaluate the following triple integrals.

   (1) \(\iiint_E \sqrt{x^2 + y^2 + z^2} \, dV\), where \(E\) is the unit ball \(\{(x, y, z) \mid x^2 + y^2 + z^2 \leq 1\}\).

   (2) \(\iiint_E (x^2 + y^2 + z^2) \, dV\), where \(E\) lies inside the sphere \(x^2 + y^2 + z^2 = 4\) in the first octant (卦限).

\[\int (1)\]

\[\int (2)\]

\[\int (3)\]