**Homework6**

1. Find an equation in rectangular coordinates for the surface represented by spherical equation, and sketch its graph.

$$\phi = \frac{\pi}{6}$$

2. Find $r(t)$ that satisfies the initial conditions.

$$r^{'}(t) = 3t^2\mathbf{j} + 6\sqrt{t}\mathbf{k},\ r(0) = \mathbf{i} + 2\mathbf{j}$$

3.Find the limit (if it exists).

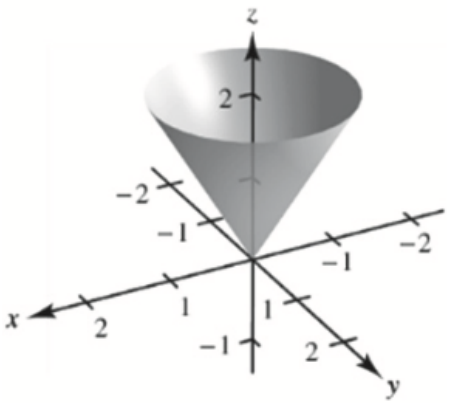
$$\lim_{t\to\infty}(e^{-t}\mathbf{i} + \frac{1}{t}\mathbf{j} + t^{\frac{1}{7}}\mathbf{k})$$

sol:

1. spherical equation

$$cos\phi = \frac{z}{\sqrt{x^2+y^2+z^2}}$$
$$\frac{3}{4} = \frac{z^2}{x^2+y^2+z^2}$$

rectangular equation , $3x^2 + 3y^2 - z^2 = 0, z \geq 0$




2.

$$r(t) = \int(3t^2\mathbf{j} + 6\sqrt{t}\mathbf{k})dt = t^3\mathbf{j} + 4t^{\frac{3}{2}}\mathbf{k} + \mathbf{C}$$
$$r(0) = C = \mathbf{i} + 2\mathbf{j}$$
$$r(t) = \mathbf{i} + (2+t^3)\mathbf{j} + 4t^{\frac{3}{2}}\mathbf{k}$$

3.

$$\lim_{t\to\infty}(e^{-t}\mathbf{i}+\frac{1}{t}\mathbf{j}+t^{\frac{1}{t}}\mathbf{k})$$

$$Note\ that\ \lim_{t\to\infty} t^{\frac{1}{t}}=1$$

$$So,\ the\ limit\ is\ 0\mathbf{i}+0\mathbf{j}+\mathbf{k}=\mathbf{k}$$