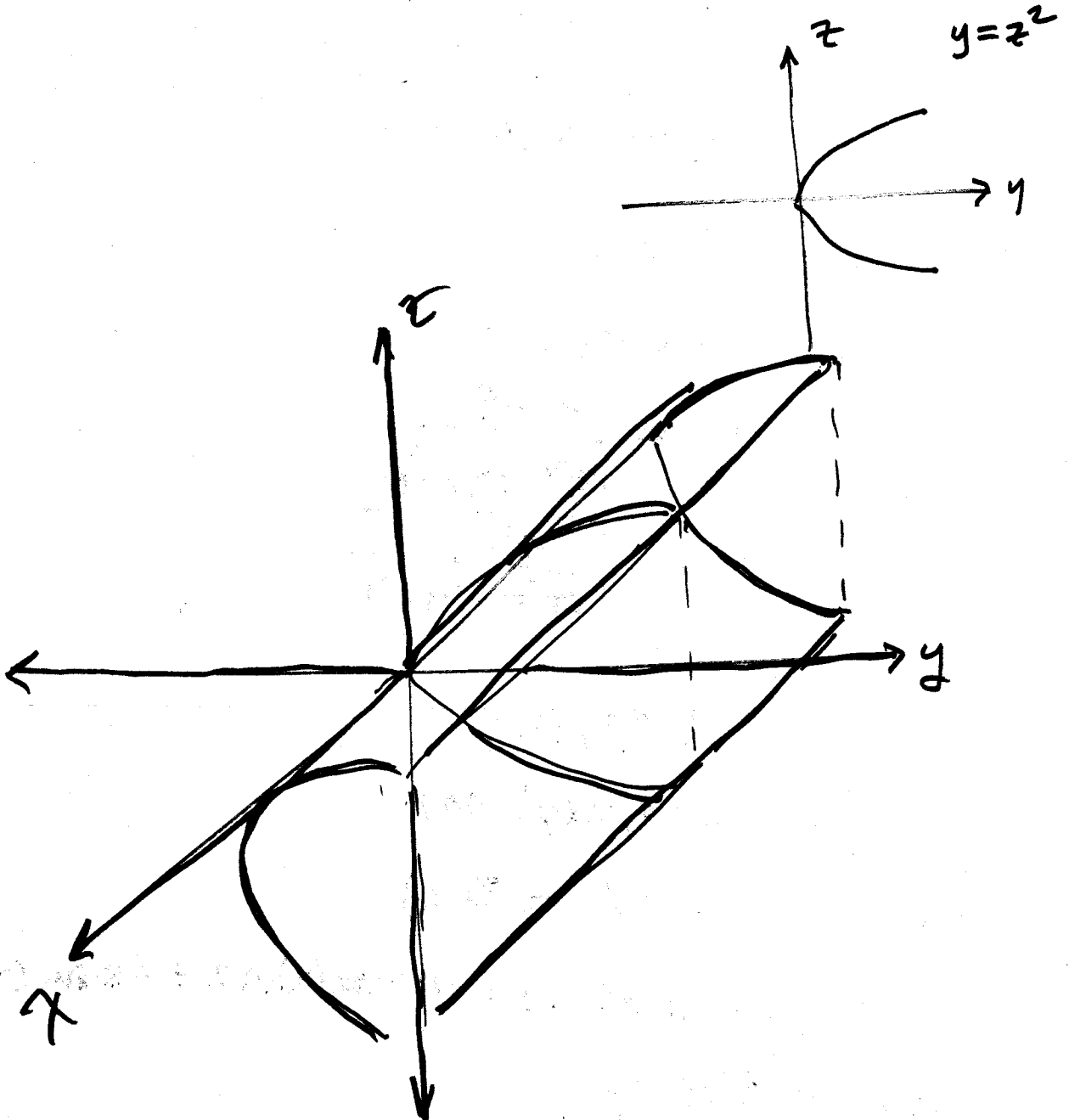


Instructions. (20 points) Answer each of the following questions in the space provided.

- (10pts) 1. In the space below, sketch the graph of  $y = z^2$  in three space.



(10pts) 2. Consider the equation

$$x^2 + 4y^2 - z^2 = 9.$$

Perform the following tasks.

- Make the appropriate substitutions to change the equation into cylindrical coordinates, then solve the equation for  $r$  in terms of  $z$  and  $\theta$ .
- List the Matlab commands that will sketch the result in part (i).

$$x = r \cos \theta, \quad y = r \sin \theta$$

$$x^2 + 4y^2 - z^2 = 9$$

$$r^2 \cos^2 \theta + 4r^2 \sin^2 \theta - z^2 = 9$$

$$r^2 = \frac{z^2 + 9}{\cos^2 \theta + 4 \sin^2 \theta}$$

$$r = \sqrt{\frac{z^2 + 9}{\cos^2 \theta + 4 \sin^2 \theta}}$$

$$z = \text{linspace}(-2, 2, 40);$$

$$\theta = \text{linspace}(0, 2 * \pi, 40);$$

$$[z, \theta] = \text{meshgrid}(z, \theta);$$

$$r = \text{sqrt}((z.^2 + 9) ./ (\cos(\theta).^2 + 4 * \sin(\theta).^2));$$

$$x = r .* \cos(\theta);$$

$$y = r .* \sin(\theta);$$

$$\text{mesh}(x, y, z).$$