Example 8: Graph and label all vertices, if there are any:

$$x^2 + 4z^2 + 16y + 8z - 12 = 0$$

Solution: Write in standard form:

$$x^2 + 4z^2 + 16y + 8z - 12 = 0$$

$$x^2 + 4[z^2 + 2z] + 16y - 12 = 0$$

$$x^2 + 4[(z+1)^2 - 1] + 16y - 12 = 0$$
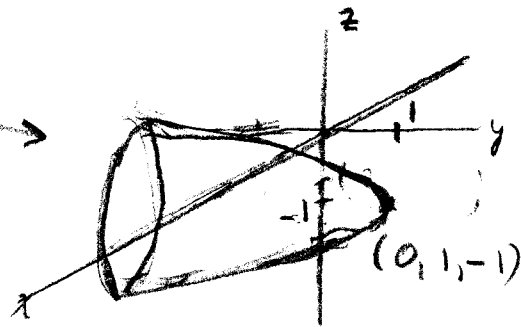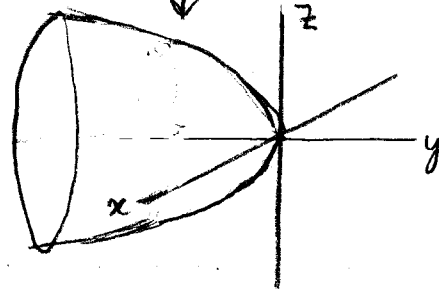
$$x^2 + 4(z+1)^2 - 4 + 16y - 12 = 0$$

$$x^2 + 4(z+1)^2 - 16 = -16y$$

$$-\frac{x^2}{16} - \frac{(z+1)^2}{4} + 1 = y$$

$$-\left[\frac{x^2}{16} + \frac{(z+1)^2}{4}\right] + 1 = y$$

$$-\left[\frac{x^2}{16} + \frac{z^2}{4}\right] = y$$

$(0, 1, -1)$

Example 9: Graph and label all vertices, if there are any:

$$2x^2 + y^2 - z^2 - 6z - 9 = 0$$

Solution: Write in standard form:

$$2x^2 + y^2 - z^2 - 6z - 9 = 0$$

$$2x^2 + y^2 - [z^2 + 6z] - 9 = 0$$

$$2x^2 + y^2 - [(z+3)^2 - 9] - 9 = 0$$

$$2x^2 + y^2 - (z+3)^2 + 9 - 9 = 0$$

$$2x^2 + y^2 - (z+3)^2 = 0$$

$xz -$ trace:

$$2x^2 - (z+3)^2 = 0$$

$$z = -3 \pm \sqrt{2}x$$