

1. Identify each 3D shape by name, using proper mathematical vocabulary. [2 pts each]

a) $\frac{y^2}{4} = 5 - \frac{x^2}{7}$

b) $y^2 + x^2 = z - 4$

c) $-z^2 + 4x^2 - y^2 = 0$

d) $2 + \frac{y^2}{8} = z + \frac{x^2}{8}$

e) $\frac{x^2}{11} + z^2 = y^2 - 6$

f) $y^2 + x^2 = -4$

2. a) Sketch the shape defined by the equation $x^2 + z^2 = y^2$ [3 pts]

b) What shape(s) is/are formed by the intersection of the shape in part (a) with the plane $y = 8$? [1 pt]

c) What shape(s) is/are formed by the intersection of the shape in part (a) with the plane $x = 3$? [1 pt]

d) Sketch the shape defined by the equation $x^2 + y^2 + z^2 = 30$ [3 pts]

e) What shape(s) is/are formed by the intersection of the shape in part (a) with the shape in part (d)? [1]

3. a) Write an equation of a Hyperboloid of 2 Sheets which opens up along the z-axis, has a vertex at $(0, 0, 6)$. [3 pts]

b) Why are there infinite answers to question 3a above?

4. Sketch each 3D graph. [3 pts each]

a) $7x - 2z = 28$

b) $x = |4y|$

c) $\frac{y^2}{4} + \frac{z^2}{16} = \frac{x}{5}$

d) $\frac{x^2}{4} - \frac{y^2}{16} + \frac{z^2}{9} = 1$

4. In **polar** coordinates, a certain conic section is defined by the equation $r = \frac{12}{2 - \cos \theta}$.

(the general equations for polar conics are $r = \frac{ep}{1 \pm e \sin \theta}$ and $r = \frac{ep}{1 \pm e \cos \theta}$)

Make a sketch of the shape.

Accurately graph and label any vertices, foci, and directrices (multiples of each, if they exist).
[5 pts]

