

## Worksheet 3

10.6 - Cylinders and Quadratic Surfaces
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1. Describe/give an example of the following:

(a) parabolic cylinder:

(b) quadric surface:

(c) elliptic paraboloid:

(d) hyperbolic paraboloid:

2. Identify and sketch the following:

(a)  $y = z^2$

(b)  $x^2 + z^2 = 3$

(c)  $4x^2 + y^2 + \frac{z^2}{7} = 1$

(d)  $x^2/9 + y^2/4 - z^2 = 0$

3. Sketch the region bounded by the surfaces  $x = \sqrt{y^2 + z^2}$  and  $y^2 + z^2 = 1$  for  $1 \leq x \leq 2$ .
4. Show that the curve of the intersection of the surfaces  $x^2 + 2y^2 - z^2 + 3x = 1$  and  $2x^2 + 4y^2 - 2z^2 - 5y = 0$  lies in a plane.

10.7 - Vector Functions and Space Curves
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1. A *vector-valued function* is any function  $\mathbf{r} : \text{---} \rightarrow \text{---}$ , that is, any function that inputs a \_\_\_\_\_, and outputs a \_\_\_\_\_.
2. If  $\mathbf{r}(t) = \langle f(t), g(t), h(t) \rangle$ , then  $\lim_{t \rightarrow a} \mathbf{r}(t) = \text{_____}$ , provided that \_\_\_\_\_.
3. A vector function  $\mathbf{r}$  is *continuous at a* if \_\_\_\_\_.
4. At what points does the helix  $\mathbf{r}(t) = \langle \sin t, \cos t, t \rangle$  intersect the sphere  $x^2 + y^2 + z^2 = 10$ ?
5. Find a vector function that represents the curve of the intersection of the paraboloid  $z = 4x^2 + y^2$  and the parabolic cylinder  $y = x^2$ .
6. Find the parametric equations for the tangent line to the curve  $x = \ln t, y = 2\sqrt{t}, z = t^2$  at the point  $(0, 2, 1)$ .