Instructions. Show all work, with clear logical steps. No work or hard-to-follow work will lose points.

- **1.)** (5 points) Classify and sketch the surface given by $z = x^2 y^2$.
- **2.)** (5 points) Classify and sketch the surface given by $x^2 + y^2 = 1 + z^2$.
- 3.) (5 points) Graph the curve and indicate the direction of positive orientation of the function

$$\mathbf{r}(t) = \langle \cos \pi t, -\sin \pi t \rangle, \quad 0 \le t \le 1.$$

4.) (5 points) Find the domain of the following function.

$$\mathbf{r}(t) = \left\langle \frac{1}{t}, \sqrt{1+t} \right\rangle$$