Solutions: quiz 3, discussion section 11am

Math 226, Fall 2019, Prof. Mazel-Gee

1. For an arbitrary point $(x, y, z) \in \mathbb{R}^3$, its distance to the y-axis is $\sqrt{x^2 + z^2}$ and its distance to the xz-plane is $|y|$. So the desired surface is described by the equation

$$\sqrt{x^2 + z^2} = 3|y| \ .$$

Because both sides are nonnegative, we obtain an equivalent equation by squaring both sides to obtain

$$x^2 + z^2 = 9y^2 \ .$$

This is the equation of a cone centered at the origin that is symmetric about the y-axis.

2. We compute that $\mathbf{r}'(t) = \langle 1, 2t, 3t^2 \rangle$ and $\mathbf{r}''(t) = \langle 0, 2, 6t \rangle$, so that

$$\mathbf{r}'(t) \times \mathbf{r}''(t) = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ 1 & 2t & 3t^2 \\ 0 & 2 & 6t \end{vmatrix} = \langle 6t^2, -6t, 2 \rangle \ .$$