

Name:

1. Determine all the **points** of intersection of the parabolic hyperboloid $z = x^2 - y^2$ and the line $\mathbf{r}(t) = \langle 2t, -t, 4t \rangle$.

2. A vector-valued function $\mathbf{r}(t)$ satisfies $\mathbf{r}'(t) = \langle e^{2t}, t \rangle$. We know additionally that $\mathbf{r}(0) = \langle 1, 2 \rangle$. Determine $\mathbf{r}(t)$.

3. A particle moves on the path

$$\mathbf{r}(t) = \langle 3 \sin(2t), 3 \cos(2t) \rangle.$$

Show that at each t that $\mathbf{r}(t)$ and $\mathbf{r}'(t)$ are perpendicular.