1. Introduction

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The main goal of this lecture is to use calculus to describe **motion** in two and three dimensions. When a bird flies around a city, its position may be described by three functions $x(t), y(t), z(t)$, where t is a time variable. Packaging these three functions into a vector $\vec{r}$ gives us a function $\vec{r}(t)$ that completely describes the bird's motion. What can the tools of multivariable calculus tell us about the motion described by $\vec{r}(t)$? We will explore the answer in this lecture and recitation.

Objectives

By the end of this lecture and recitation, you will be able to:

1. Use **parametric equations** to describe motion in 2D and 3D.
2. Compute and interpret the **velocity vector** and **unit tangent vector** for a given parametric curve.
3. Visualize **trajectories** using vector arithmetic.
4. Recognize the equations that describe a **helix**.

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