18.02A Recitation — Monday, Nov. 5, 2018

Quick Review

- Trajectory question—use $\mathbf{a}(t)$ or $\mathbf{v}(t)$, and the initial state to figure out position vector $\mathbf{r}(t)$.
- Functions of several variables $z = f(x, y)$.
  - level curves—for any choice of z, $c = z = f(x, y)$ gives a curve in the (x, y) plane;
  - Graph—a surface in 3D.
- Partial derivatives $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$
  - How to compute them—for example, when calculating $\frac{\partial f}{\partial x}$, treat y as a constant.
  - Geometric meaning. For example, $\frac{\partial f}{\partial x}(a, b)$: the graph $z = f(x, y)$ intersects $y = b$ at a curve $\rightsquigarrow$ slope of the tangent line to that curve at $x = a$.

Practice problems:

1. Consider $z = 1 - x - y$. Draw its level curves and graph.

2. Consider $z = 2\sqrt{x^2 + y^2}$. Draw its level curves and graph.

3. Draw the graph of $z = f(x, y) = y^2$. (Notice that although x is missing, this is still treated as a function of two variables and thus its graph is in 3D. Think about what the missing variable mean. You actually saw this kind of stuff in single variable calculus. $y = f(x) = 1$ has no x in it.)

4. Consider $f(x, y) = 2\sqrt{x^2 + y^2}$. Find $f_x(1, 1)$. What does this number mean, geometrically?

5. (if we have time) Show Newton's first law of motion: a moving particle that no force acts on shall move at a constant speed along a straight line.