Basic skills list for the 126 Midterm 2

The following is a collection of some of the things you are expected to be able to do on the second midterm. It is intended as a starting point, not as a comprehensive summary of the material. You are also expected to be able to combine these skills to solve more complex problems such as those that appeared in the assigned homework.

1. Vector functions, space curves, and motion

   You should be able to:

   (a) Find the derivative $\vec{r}'(t)$ or integral of a given vector function $\vec{r}(t)$

   (b) Find the arc length of a piece of a space curve defined by $\vec{r}(t)$

   (c) Understand what it means to reparametrize a curve with respect to arc length

   (d) Find the curvature κ at a point on a space curve $\vec{r}(t)$ or on a planar curve $y = f(x)$

   (e) Determine the unit tangent and principal unit normal for a space curve $\vec{r}(t)$

   (f) Find the velocity and acceleration vector functions for a particle whose motion is specified by $\vec{r}(t)$

2. Functions of Several Variables

   You should be able to:

   (a) Describe and sketch the domain of a given two variable function

   (b) Sketch level curves of a given two variable function

   (c) Find the partial derivatives $f_x, f_y, f_{xx}, f_{xy}, f_{yx}$, and f_{yy} of a given two variable function $f(x, y)$

   (d) Find and classify the critical points of a function of two variables

   (e) Solve max/min problems involving functions of two variables

3. Multiple Integrals

   You should be able to:

   (a) Express the volume beneath a surface $z = f(x, y) > 0$ over a region R in the plane as a double integral

   (b) Evaluate double integrals over general regions.