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 curvature κ at a point on a space curve $\vec{r}(t)$, on a planar curve (e.g. a curve given by $y = f(x)$ or parametrically).

   (b) Find the point of maximum curvature on a planar or space curve.

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

   (d) 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.

   (c) Change the order of integration to evaluate a double integral.

   (d) Use polar coordinates to evaluate double integrals.

   (e) Find the center of mass of a two-dimensional lamina with variable density.