

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. Parametric and polar stuff

You should be able to determine or find:

- (a) $\frac{dy}{dx}$ given $x = f(t)$ and $y = g(t)$
- (b) The tangent line to a curve defined parametrically
- (c) The arc length of (a piece of) a curve specified by $x = f(t)$, $y = g(t)$
- (d) The area of a surface created by revolving a piece of a curve $x = f(t)$, $y = g(t)$ about the x - or y -axis
- (e) Cartesian equation of a curve defined using polar equations, and vice versa
- (f) Tangent line to a curve defined with a polar equation

You should be able to sketch the graph of a curve defined by a simple polar equation.

2. Vector functions, space curves, and motion

You should be able to:

- (a) Find the derivative $\vec{r}'(t)$ 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) Find the curvature κ at a point on a space curve $\vec{r}(t)$ or on a planar curve $y = f(x)$
- (d) Determine the unit tangent, principal unit normal, and binormal vector functions for a space curve $\vec{r}(t)$
- (e) Find the velocity and acceleration vector functions for a particle whose motion is specified by $\vec{r}(t)$

3. 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 $f(x, y)$