

MAE 301/501 HOMEWORK-1 DUE ON THURSDAY, SEPTEMBER 1

One goal for this course is for you to develop your skill in effectively communicating mathematics. With this in mind, you should clearly write up your solutions. Solutions with little or no justification will receive little or no credit.

- (1) Give a clear proof of the Pythagorean theorem. For this problem, it is okay to consult outside sources, and these must be cited. I am interested in how well you **explain** and understand the proof.
- (2) An ellipse is defined to be the set of points in the plane, the sum of whose distances to two fixed points is a constant. Use this definition to derive the equation for an ellipse, centered at the origin.
- (3) A parabola is defined to be the set of points in the plane that are equidistant from a fixed line and a fixed point. Use this definition to derive the equation for a parabola, with vertex at the origin.
- (4) Use the previous problem to write the equation for a parabola with vertex at an arbitrary point (h, k) in the plane, and justify your solution.
- (5) In high school, students use several special forms for the equation of a parabola. Three of these are standard form, vertex form, and factored form. For each of these, explain what the equation tells you about the graph of the parabola. Given the equation for a parabola in standard form, explain how to write it in vertex form.