

**MAE 301/501 HOMEWORK-1 DUE AT THE BEGINNING OF CLASS 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) In class Gabrielle claimed that, for a prime p , whenever $p^2|a^2$, it follows that $p|a$. Either prove this claim or find a counter-example.
- (2) Gabrielle also claimed that, for integers d , a , and b , whenever $d|a$ and $d|b$, it follows that $d|(a + b)$. Either prove this claim or find a counter-example.
- (3) In class we (will have) seen two different ways to generate primitive Pythagorean triples. The expressions we obtain from these two methods look slightly different. Show that they indeed generate the same primitive triples.
- (4) Show how to use our methods by generating three primitive Pythagorean triples that we hadn't found in class.
- (5) 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.
- (6) Use the Pythagorean theorem to find the distance between points (x_1, y_1, z_1) and (x_2, y_2, z_2) in \mathbb{R}^3 . If needed, start with an explicit example.
- (7) Above you generate a 3-dimensional distance formula. What is the 1-dimensional distance formula?