

**MATH 301/501 HOMEWORK-1 DUE AT THE BEGINNING OF CLASS ON
THURSDAY, SEPT24.**

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)
 - (a) In high school we generally introduce the sine and cosine functions as functions of acute angles in right triangles. Give this definition.
 - (b) Clearly explain a way to *extend* this definition to the set of *all* angles.
 - (c) Explain why the definitions are equivalent when we restrict to acute angles.

- (2)
 - (a) Give a clear, concise definition of an equivalence relation on a set.
 - (b) Take S to be the set of all angles. Use trigonometric functions to define an equivalence relation which makes each angle equivalent to its reference angle.
 - (c) Prove that it is an equivalence relation.

- (3)
 - (a) Take the set of all polynomials. Give an equivalence relation on this set, and prove that it is an equivalence relation.
 - (b) What are the equivalence classes?

- (4)
 - (a) Give our definition of the set of rational functions as a set of equivalence classes of ratios of polynomials.
 - (b) Give an example of two rational functions that satisfy our algebraic definition of equivalence, but which are not equal when viewed as functions.