

**MATH 301/501 HOMEWORK-3 DUE AT THE BEGINNING OF CLASS ON  
THURSDAY, SEPT. 25**

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.

- (1) Write a clear, concise definition of an equivalence relation on a set.
- (2) Give an example of an equivalence relation on the set of all polynomial functions that would be relevant to a high school algebra student. Clearly state the relation and the describe the resulting equivalence classes.
- (3) Give an example of an equivalence relation on the set of all polynomial functions that would be relevant to a high school calculus student. Clearly state the relation and describe the resulting equivalence classes.
- (4) Give any example of an equivalence relation that appears in high school or middle school mathematics. Clearly state the set and the relation, and describe the resulting equivalence classes.
- (5)
  - (a) Give the domain and range of the function  $f(x) = \sin x$ .
  - (b) Is this function injective? Explain.
  - (c) What is the definition or meaning of the function  $g(x) = \sin^{-1} x$ ? Give a few examples.
  - (d) Give the domain and range of the function  $g(x) = \sin^{-1} x$ .
  - (e) How are the  $\sin^{-1} x$  function and its domain related to our study of equivalence relations and equivalence classes?
- (6)
  - (a) In class, we gave a definition of rational numbers as equivalence classes of ratios of integers. Clearly state this definition.
  - (b) Give an analogous definition of *rational functions* as equivalence classes of ratios of polynomials.
  - (c) Describe the equivalence classes. Include some examples of ratios of polynomials that lie in the same class, and give some examples of ratios of polynomials that lie in different classes.
- (7) *More may be posted.*