Class Work: Other Forms of Mathematical Induction
This is a full-time activity worth 10 points.

Problems of the Day

Individual work (5 points)

Write responses to the following on separate pages. Do these individually; you can ask questions to the professor as he circulates in the room.

1. Suppose you wanted to prove that $n! > 3^n$. For what natural number values does this appear to be true? Show some work to justify your answer.

2. For each of the following statements, suppose you were going to prove the statement by mathematical induction. Then state:

   - The predicate $P(n)$ involved in the statement;
   - What you would need to prove for the base case;
   - What your inductive hypothesis would be (including the quantifier);
   - What you would need to prove after assuming the inductive hypothesis; and
   - Whether you would use the Principle of Mathematical Induction, the Extended Principle of Mathematical Induction, or the Second Principle of Mathematical Induction. Give a brief explanation of your reasoning.

   (a) For all integers $n > 4$, $2^n > n^2$.
   (b) Every integer greater than or equal to 12 can be written as a ~~positive~~ integer multiple of 4 plus a ~~positive~~ integer multiple of 5. (Hint: Remember to identify the predicate first.)

Group work (5 points)

1. Check your answers together on the individual work portion.

2. Do ONE of the following and write it up formally:

   (a) Prove that for all integers $n > 4$, $2^n > n^2$.
   (b) Prove that every integer greater than or equal to 12 can be written as a ~~positive~~ integer multiple of 4 plus a ~~positive~~ integer multiple of 5.
   (c) Consider the function $f(x) = \ln x$. Take the first, second, third, up through the sixth derivative of f. Based on your evidence, form a conjecture about the nth derivative of this function and then prove it using mathematical induction.

Parameters

The individual portion of your work will be collected no later than 25 minutes past the hour, so work quickly. If your group finishes the proof you're assigned, please hand it in at the end of class. If it is not done by the end of class, it is to be completed as individual homework for Friday's class.