Problem Set 5

Disclaimer For open-ended problems, part of the problem is to give a precise formulation. Especially for the problems in Part II, you should do as much of the problems as is useful to you. For each problem, it is important you understand how to verify all details. However, if you are pressed for time, you may write-up only the most important steps, instead of every detail.

Late homework policy. Late work will be accepted only with a medical note or for another approved reason.

Cooperation policy. You are strongly encouraged to work with others, but the final write-up must be entirely your own and based on your own understanding.

Part I. These problems are from the textbook. You are expected to read *all* the problems from the sections of the textbook covered that week. You are asked to write-up and turn-in only the problems assigned below.

Part II. These problems are not necessarily from the textbook. Often they will be exercises in commutative algebra, category theory, homological algebra or sheaf theory.

Part I(25 points)
  (a) (5 points) p. 105, Section II.4, Problem 4.1
  (b) (10 points) p. 106, Section II.4, Problem 4.6
  (c) (10 points) p. 107, Section II.4, Problem 4.7(e)

Part II(25 points)

Problem 1(5 points) Work though the details of Exercise II.4.10 on p. 107 of the textbook (the sketch of the proof will be given in lecture, or you can come by and talk to me for the sketch).

Problem 2(10 points) Work through Exercise II.4.11 on pp. 107-108 of the textbook. In practice, the valuative criterion is often checked using DVRs instead of arbitrary valuation rings.

Problem 3(10 points) Do one of the " fun problems" from lecture. They are collected in the lecture summaries on the webpage.

Extra credit(5 points) Give an example of a valuation ring that is not a DVR. You may want to look at Exercise II.4.12 on p. 108 of the textbook.