Homework Problem, Decision Analysis

You are manager of a city which has a problem with potholes in the city
streets. The city council has instructed you to develop a recommendation
for the best method of having the potholes repaired. The standard method
of repairing potholes is certain to do the job successfully, and would
cost the city $2,000,000. A new method for repairing potholes has been
developed, and can be tried for $1,000,000. However, this method is not
always successful, and the city engineer has advised the manager that the
new method has about an 80% chance of working. If the new method did not
work, the standard method would have to be used, for a total cost of
$3,000,000.

1) What recommendation should the manager make to the city council,
   based on the expected monetary value criterion?

2) Assume that an additional option available is to conduct a study
   to acquire more information on the effectiveness of the new method
   when applied to conditions like those found in the city. The
   study would cost $200,000, and if the new method will work, the
   study has a 90% chance of correctly concluding that the new method
   would be effective. If the new method will not work, the study has
   a 30% chance of mistakenly concluding that the new method would be
   effective.

   a) What recommendation should the manager now make to the city
      council, based on the expected monetary value criterion?

   b) What is the most the manager should be willing to pay a
      consulting firm, based on the expected monetary value criterion?

3) What is the most the manager should be willing to pay a consulting
   firm for a study that would tell for sure whether the new method
   would work or not in the city? (That is, what is the expected value
   of perfect information?)