Duration and Convexity Problems

1. A 6 year annuity pays $1,000 at the end of each year.
   a. Compute the price of the annuity at an effective annual interest rate of 2%.
   b. Compute the modified duration at an effective annual interest rate of 2%.
   c. Compute the (Macaulay) duration at an effective annual interest rate of 2%.
   d. Compute the modified convexity at an effective annual interest rate of 2%.
   e. Compute the Macaulay convexity at an effective annual interest rate of 2%.
   f. Estimate the new price of the annuity if the interest rate changes to 1.9% using the first-order modified approximation.
   g. Estimate the new price of the annuity if the interest rate changes to 1.9% using the first-order Macaulay approximation.