

## Chapter 3 Project *A Graphical Approach to Compound Interest*

In this project, you will use a graphing utility to compare savings plans. For instance, you deposit \$1000 in a savings account and are given the following options.

- 6.2% annual interest rate, compounded annually
  - 6.1% annual interest rate, compounded quarterly
  - 6.0% annual interest rate, compounded continuously
- a. For each option, write a function that gives the balance as a function of the time  $t$  (in years).
  - b. Use a graphing utility to graph all three functions in the same viewing window. Can you find a viewing window that distinguishes among the graphs of the three functions? If so, describe the viewing window.
  - c. Find the balances for the three options after 25, 50, 75, and 100 years. Is the option that yields the greatest balance after 25 years the same option that yields the greatest balances after 50, 75, and 100 years? Explain.
  - d. The *effective yield* of a savings plan is the percent increase in the balance after 1 year. Find the effective yields for the three options listed above. How can the effective yield be used to decide which option is best?

### Questions for Further Exploration

1. You deposit \$25,000 in an account to accrue interest for 40 years. The account pays 4% compounded annually. Assume that the income tax on the earned interest is 30%. Which of the following plans produces a larger balance after all income tax is paid?
  - (a) *Deferred* The income tax on the interest that is earned is paid in one lump sum at the end of 40 years.
  - (b) *Not Deferred* The income tax on the interest that is earned each year is paid at the end of each year.
2. Which of the following would produce a larger balance? Explain.
  - (a) 4.02% annual interest rate, compounded monthly
  - (b) 4% annual interest rate, compounded continuously
3. You deposit \$1000 in each of two savings accounts. The interest for the accounts is paid according to the two options described in Question 2. How long would it take for the balance in one of the accounts to exceed the balance in the other account by \$100? By \$100,000?
4. No income tax is due on the interest earned in some types of investments. You deposit \$25,000 into an account. Which of the following plans is better? Explain.
  - (a) *Tax-Free* The account pays 5%, compounded annually. There is no income tax due on the earned interest.
  - (b) *Tax-Deferred* The account pays 7%, compounded annually. At maturity, the earned interest is taxable at a rate of 40%.