from now is given by solving (9.5)

$$P = Ve^{-rT}. \quad (9.6)$$

The formulae (9.5) and (9.6) assume a constant interest rate r. Also, we have not yet considered the continuous-discounting analogue of finding the present value of an income stream, which we did for annual discounting in Section 5.3. So there is a lot more to be said on this topic, but that will have to wait until Chapter 19.

Exercises

9.1.1 Use a calculator to verify

$$\text{(a) } e^2e^3 = e^5, \quad \text{(b) } e^8/e^2 = e^6, \quad \text{(c) } e^{-4} = 1/e^4, \quad \text{(d) } (e^{1.5})^4 = e^6.$$

9.1.2 Find the value after 10 years of £500 compounded (a) annually, (b) monthly, (c) continuously, at an interest rate of 4% per annum. Comment.

How do your answers change when the time period involved is $2\frac{1}{2}$ years?

9.1.3 Find the present value of £400 to be paid in 5 years time if it is discounted (a) annually, (b) monthly, (c) continuously, at a rate of 7% per annum. Comment.

9.1.4 Differentiate

$$\text{(a) } e^{2x} + 3e^{-4x}, \quad \text{(b) } xe^{2x}, \quad \text{(c) } x/(1+e^x), \quad \text{(d) } (e^{3x}-1)^4.$$

9.2 Natural logarithms

Let x be a positive number. The **natural logarithm** of x is the logarithm to base e of x,