

## PRACTICE QUESTIONS

The questions which follow are not designed to cover every aspect of the syllabus, nor are they exam style questions. Their purpose is to give you some practice in the *basics*: if you cannot, for example, carry out a straightforward differentiation, then you will get questions which depend on accurate differentiation wrong, even if you know exactly how to do the question. So you need to answer all these questions as part of your revision. If you get an answer wrong, find out why: then come back to it later, and see if you can get it right next time.

### ALGEBRA

1. Find the 25th term and the sum of the first 54 terms of the sequence which begins: 3, 8, 13, 18 ...
2. An arithmetic sequence has first term 7 and common difference 3.5. How many terms are required for the sum of the sequence to be 25830.
3. What is the 12th term and the sum to 18 terms of the sequence which begins 3, 12, 48, 192?
4. A geometric series has a first term 400, ten terms and a sum of 1295.67. What is the common ratio?
5. Why does the sum to infinity exist for the sequence 100, 80, 64, 51.2? Find  $S_{20}$  and  $S_{\infty}$  and also the percentage error in approximating  $S_{\infty}$  by  $S_{20}$ .
6. How much will an investment of \$6300 be worth (to the nearest dollar) after accumulating compound interest for 12 years at a rate of 3% per annum? If 1.5% interest is paid every 6 months, how much will the investment be worth after 12 years?
7. Write the recurring decimal  $0.1\bar{3}4$  as a fraction in its simplest form.
8. Write  $2 + 3\log_{10}x$  as a single logarithm.
9. Solve the equation  $2\log_a x - \log_a 3 = \log_a 27$ .
10. Write as single powers of  $x$ :  $\frac{1}{x^2}$ ,  $(\sqrt{x})^5$ ,  $(x^3)^4$ ,  $x^2 \div x^{-5}$ .
11. If  $s = 3 + 10e^{0.4t}$ , use algebra to find  $t$  when  $s = 23.54$
12. Calculate  $\log_3 30$ .
13. Find the constant term in the expansion of  $\left(3x - \frac{1}{x}\right)^6$ .

### FUNCTIONS AND EQUATIONS

1. Find the range of the function  $f(x) = \frac{x^3 - 2}{x}$ ,  $x < 0$ .
2. Find the largest possible domain of the function  $f: x \rightarrow \frac{1}{\sqrt{9 - 4x^2}}$
3. Why is the inverse of  $f: x \rightarrow x(x - 2)$  not a function? Suggest a domain restriction which would ensure that  $f^{-1}(x)$  is a function.
4. If  $f: x \rightarrow x + 1$  and  $g: x \rightarrow x^3$ , find the function  $(f \circ g)^{-1}$ .
5. If  $f: x \rightarrow (2x + 1)$  and  $g: x \rightarrow \cos x$ ,  $0 \leq x \leq \pi$ , solve the equation  $(g \circ f)(x) = 0.8$ .
6. For the graph of  $f(x) = \frac{e^{-x}}{(x + 1)^2}$ , identify any horizontal and vertical asymptotes. Find the turning point, and the solutions of the equation  $f(x) = 7$ .
7. What transformations for  $y = x^2$  can be used to obtain the graph of  $y = 2(x - 3)^2 + 1$ ? Hence write down the turning point of the graph.
8. By considering transformations of  $y = e^x$ , sketch the graph of  $y = -e^{(x + 1)} + 2$ . Mark the position to which the point  $(0, 1)$  has been transformed.
9. Use the quadratic formula to solve  $x + 3 = \frac{2}{x}$ .
10. Complete the square for:  $x^2 - 4x + 2$ ,  $2x^2 + 6x + 5$ ,  $12 - 2x - x^2$ .
11. For each of the quadratics in 10, write down the turning point and the line of symmetry.