

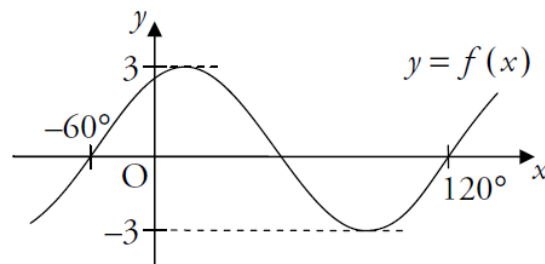
1. Find the equation of the tangent to the curve with equation $y = \frac{4}{(x^2 - 3)^2}$ at the point where $x = 2$. 6

2. The functions f and g are defined on suitable domains by

$$f(x) = \frac{1}{\sqrt{x+3}} \quad \text{and} \quad g(x) = x^2 - 2$$

- (a) State any restrictions on the domain of f . 1
- (b) Find an expression for $h(x)$ where $h(x) = g(f(x))$, giving your answer as a single fraction. 3
3. On the first day of March, a bank loans a man £2500 at a fixed rate of interest of 1.5% per month. This interest is added on the last day of each month and is calculated on the amount due on the first day of the month. He agrees to make repayments on the first day of each subsequent month. Each repayment is £300 except for the smaller final amount which will pay off the loan.
- (a) The amount that he owes at the start of each month is taken to be the amount still owing just after the monthly repayment has been made.
Let u_n and u_{n+1} represent the amounts that he owes at the start of two successive months. Write down a recurrence relation involving u_{n+1} and u_n . 2
- (b) Find the date and the amount of the final payment. 4

4. Below is a sketch of the graph of $y = f(x)$ where $f(x) = a \sin(bx^\circ + c^\circ)$.



- (a) State the values of a , b , and c . 3
- (b) Make an annotated sketch of the graph of $y = 2 - f(x)$ 3

5. A curve has equation $y = x^3 + ax^2 + bx - 2$.

When $x = 3$, the tangent to the curve has equation $6x - y = 20$.

When $x = 2$, the tangent to the curve makes an angle of 135° with the positive direction of the x -axis.

(a) Determine the values of a and b . 9

(b) Find the x -coordinates of the curve's stationary points, in the form

$$x = \frac{4 \pm \sqrt{c}}{3}. \quad 3$$

34 Marks
