

Unit Exercise 1

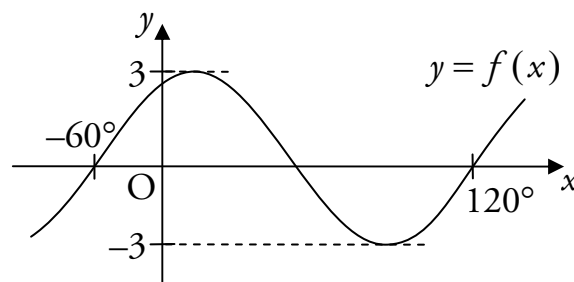
Marks

1. Triangle PQR has vertices $P(1, -3)$, $Q(4, 6)$ and $R(-4, 7)$.
- (a) Find the equation of altitude QS, where the point S lies on the line PR. 3
- (b) Find the area of triangle PQR. 5

2. Find the values of x for which the function defined on a suitable domain by $f(x) = x^3 - 6x - 5$ is decreasing. 4

3. Calculate, to the nearest degree, the angle between the x -axis and the tangent to the curve with equation $y = 2x^3 - 3x - 10$ at the point where $x = -1$. 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 where $-90 \leq c \leq 90$. 3
- (b) Make a fully annotated sketch of the graph of $y = 2 - f(x)$. 2

5. The wardens at a zoo are designing a large enclosure to house the chinchillas. The four sides and top of the enclosure will be made out of wire mesh. The internal volume of the enclosure will be 32 m^3 and the top will be square.

- (a) If the internal length of one edge of the top is x metres, show that the total internal surface area of wire mesh A square metres is given by

$$A(x) = x^2 + \frac{128}{x} \quad 4$$

- (b) The cost of the wire mesh is to be kept as low as possible. Calculate the dimensions of the enclosure which will give the minimum surface area of wire mesh. 6