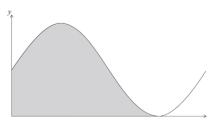


IB Calculus Problem 12

Let $f(x) = 6 + 6 \sin x$.

Part of the graph of f is shown below.

The figure is not to scale.



The shaded region is bounded by the curve of f , the x-axis and the y-axis.

The path makes an angle of 4° with the horizontal.

A. Solve, for $0 \leq x \leq 2\pi$

i. $6 + 6 \sin x = 6$.

ii $6 + 6 \sin x = 0$.

B. Write down the exact value of the x-intercept of f , for $0 \leq x \leq 2\pi$.

C. The area of the shaded region is k . Find the value of k , giving your answer in terms of π .

Let $g(x) = 6 + 6 \sin(x - \frac{\pi}{2})$. The graph of f is transformed to that of g .

D. Give a full geometric description of this transformation.

E. Given that $\int_p^{p + \frac{2\pi}{2}} g(x) dx = k$ and $0 \leq p < 2\pi$, write down the two values of p .