5 In this question you must show detailed reasoning.

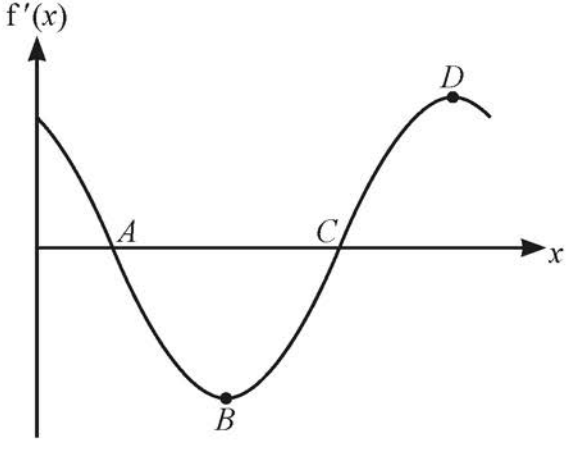
The function f is defined by $f(x) = \cos x + \sqrt{3}\sin x$ with domain $0 \leqslant x \leqslant 2\pi$.

(a) Solve the following equations.

(i) $f'(x) = 0$ **[4]**

(ii) $f''(x) = 0$ **[3]**

The diagram shows the graph of the gradient function $y = f'(x)$ for the domain $0 \leqslant x \leqslant 2\pi$.



(b) Use your answers to parts **(a)(i)** and **(a)(ii)** to find the coordinates of points A, B, C and D. **[2]**

(c) **(i)** Explain how to use the graph of the gradient function to find the values of x for which $f(x)$ is increasing. **[1]**

(ii) Using set notation, write down the set of values of x for which $f(x)$ is increasing in the domain $0 \leqslant x \leqslant 2\pi$. **[2]**