8   A function f is defined by $f : x \mapsto 3\cos x - 2$ for $0 \leqslant x \leqslant 2\pi$.

    (i) Solve the equation $f(x) = 0$. [3]

    (ii) Find the range of f. [2]

    (iii) Sketch the graph of $y = f(x)$. [2]

A function g is defined by $g : x \mapsto 3\cos x - 2$ for $0 \leqslant x \leqslant k$.

    (iv) State the maximum value of k for which g has an inverse. [1]

    (v) Obtain an expression for $g^{-1}(x)$. [2]