**9** The function f is such that $f(x) = 3 - 4\cos^k x$, for $0 \leqslant x \leqslant \pi$, where $k$ is a constant.

  **(i)** In the case where $k = 2$,

     **(a)** find the range of f, [2]

     **(b)** find the exact solutions of the equation $f(x) = 1$. [3]

  **(ii)** In the case where $k = 1$,

     **(a)** sketch the graph of $y = f(x)$, [2]

     **(b)** state, with a reason, whether f has an inverse. [1]