Computation Theory

What is meant by a register machine? Explain the action of a register machine program. [6 marks]

What does it mean for a partial function \( f(x_1, \ldots, x_n) \) of \( n \) arguments to be register machine computable? [3 marks]

Design register machines to compute the following functions.

\[
f(x_1, x_2) = x_1 + x_2 \quad [2 \text{ marks}]
\]

\[
g(x_1) = \begin{cases} 42 & \text{if } x_1 > 0 \\ \text{undefined} & \text{otherwise} \end{cases} \quad [2 \text{ marks}]
\]

\[
h(x_1) = 2^{x_1} \quad [4 \text{ marks}]
\]

Give an example of a function that is not register machine computable, stating clearly any well-known results you use. [3 marks]