CSC240 Winter 2021 Midterm Assessment Question 4

YOUR NAME and STUDENT NUMBER

4. (15 marks) Let $\mathscr{F}$ denote the set of all functions from $\mathbb{N}$ to $\mathbb{R}^+ \cup \{0\}$.
Recall that $\Omega(f') = \{g' \in \mathscr{F} \mid \exists c \in \mathbb{R}^+.\exists b \in \mathbb{N}.\forall n \in \mathbb{N}.[(n \geq b) \text{ IMPLIES } (g'(n) \geq c \cdot f'(n))]\}$.
For any functions $f \in \mathscr{F}$ and $g \in \mathscr{F}$,
let $f + g$ denote the function $a \in \mathscr{F}$ where $a(n) = f(n) + g(n)$ for all $n \in \mathbb{N}$ and
let $\max\{f, g\} \in \mathscr{F}$ denote the function $m \in \mathscr{F}$ where $m(n) = \max\{f(n), g(n)\}$ for all $n \in \mathbb{N}$.

Formally prove $\forall f \in \mathscr{F}.\forall g \in \mathscr{F}.[\max\{f, g\} \in \Omega(f + g)]$.

Number every line of your proof. Explicitly state when a proof technique is being applied and say which earlier lines it refers to.
Use proper indentation. However, to avoid excessive indentation, do not indent when making definitions.

Solution:

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