Levin reduction

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If R_1 and R_2 are search problems and $\mathcal{C}$ is a complexity class then a $\mathcal{C}$ *Levin reduction* of R_1 to R_2 consists of three functions $g_1, g_2, g_3 \in \mathcal{C}$ which satisfy:

- g_1 is a $\mathcal{C}$ Karp reduction of $L(R_1)$ to $L(R_2)$
- If $R_1(x, y)$ then $R_2(f(x), g(x, y))$
- If $R_2(f(x), z)$ then $R_1(x, h(x, z))$

Note that a $\mathcal{C}$ Cook reduction can be constructed by calculating $f(x)$, using the oracle to find z, and then calculating $h(x, z)$.

$\mathcal{P}$ Levin reductions are just called Levin reductions.