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On the consequences of the weak field approximation JOHN LAUBENSTEIN, Northern Illinois University (alumnus) — General Relativity reduces to Newtonian gravity within the appropriate limit. But, what is that limit? The conventional response is that of the weak field approximation in which the gravitating source is weak and velocities are low. But, this is a far cry from a quantitative statement. In that regard, the weak field may be defined more quantitatively as one in which any error introduced is far beyond the level of precision required. Since the field can always be made incrementally weaker there is no limit as to the degree of precision that can be achieved. In this regard, GR reduces exactly to Newtonian gravity at the limit where velocity goes to zero. It is only out of convenience that we extend this to include those conditions where v << c with the argument that any error is arbitrarily small. However, in practice GR can be shown to reduce to an exact Newtonian expression at v > 0. How can this observation fit with the quantitative definition of the weak field? This paper explores the consequences of the weak field approximation and the fact that GR reduces directly to Newtonian gravity within the weak field as opposed to the more specific condition where v = zero.

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