The classical "BT-Theorem" of Murray and von Neumann states that if $M$ is a von Neumann algebra on a Hilbert space $H$, and $\xi, \eta$ are vectors in $H$ such that $\eta$ belongs to the closure of $M\xi$, then $\eta = bT\xi$ where $b \in M$ and $T$ is a densely defined, closed linear operator affiliated to $M$. It can be extended to sequences in $M\xi$ as follows:

If $(\eta_k)_{k \geq 1}$ is a sequence in $M\xi$ such that

$$\sum_{k=1}^{\infty} \|\eta_k\|^2 < +\infty,$$

then

$$\eta_k = b_kT\xi, \quad k \geq 1$$

where $T$ is a densely defined, closed linear operator affiliated to $M$ and $b_k \in M$ can be chosen such that $\lim_{k \to \infty} \|b_k\| = 0$.

The above extended "BT-Theorem" can be applied to the proof of automatic continuity results in fairly general situations.

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