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Torsion theories in the cluster category of Dynkin type A_∞

Let $\mathcal{D}$ be the cluster category of Dynkin type A_∞ with translation functor Σ. Let $\mathcal{U}$ be a cluster tilting subcategory of $\mathcal{D}$. Then by definition $(\mathcal{U}, \Sigma\mathcal{U})$ is a torsion theory. Now given any subcategory $\mathcal{X}$ of $\mathcal{D}$, we provide the equivalent conditions for the pair $(\mathcal{X}, \mathcal{Y})$ to be a torsion theory for some subcategory $\mathcal{Y}$ of $\mathcal{D}$.

Given any subcategory $\mathcal{U}$ of $\mathcal{D}$, not all torsion theories $(\mathcal{U}, \mathcal{U}^\perp)$ are t-structures. Therefore we press on to give a characterization of t-structures in $\mathcal{D}$ on the Auslander-Reiten quiver. The simplicity of the way t-structures are visualized on the Auslander-Reiten quiver gives a subtle hint with regard to the description of the "t-structure triangles" in $\mathcal{D}$, which turns out to be faithful to our intuition by a rigorous proof with the involvement of the octahedral axiom.