Definition 1. *X is an H^0-complex if $H^i(X) \neq 0 \implies i = 0$.*

Theorem 2. *The precomposition of the localization functor $\mathcal{Q} : \mathrm{Kom}(\mathcal{C}) \to \mathrm{D}(\mathcal{C})$ with embedding $i_0 : \mathcal{C} \to \mathrm{Kom}(\mathcal{C})$ defines an equivalence between $\mathcal{C}$ and the full subcategory of $\mathrm{D}(\mathcal{C})$ consisting of H^0-complexes.*

Definition 3. *$X[i] = T^i([X])$ for $X \in \mathcal{C}$.*

Definition 4. *$\mathcal{C}$ – abelian, then $\mathrm{Ext}^i_{\mathcal{C}}(X, Y) = \mathrm{Hom}_{\mathrm{D}(\mathcal{C})}(X[0], Y[i])$.*

Remark 5. One does not need projectives or injectives in this definition.

Remark 6. $\mathrm{Ext}^i_{\mathcal{C}}(X, Y) = \mathrm{Hom}_{\mathrm{D}(\mathcal{C})}(X[k], Y[k+i])$ for any $k \in \mathbb{Z}$.

Definition 7 (multiplication)**.** *There is a multiplication*

$$\mathrm{Ext}^i_{\mathcal{C}}(X, Y) \times \mathrm{Ext}^j_{\mathcal{C}}(Y, Z) \to \mathrm{Ext}^{i+j}_{\mathcal{C}}(X, Z)$$

via composition $\mathrm{Hom}_{\mathrm{D}(\mathcal{C})}(X[0], Y[i]) \times \mathrm{Hom}_{\mathrm{D}(\mathcal{C})}(Y[i], Z[i+j]) \to \mathrm{Hom}_{\mathrm{D}(\mathcal{C})}(X[0], Z[i+j])$*.*

Fact 8. *For an exact sequence $0 \to Y' \to Y \to Y'' \to 0$ there is an exact sequence*

$$\ldots \to \mathrm{Ext}^i(X, Y') \to \mathrm{Ext}^i(X, Y) \to \mathrm{Ext}^i(X, Y'') \to \mathrm{Ext}^{i+1}(X, Y') \to \ldots$$

Exercise 9. Show that if $X \to Y \to Z \to X[1]$ is distinguished in $\mathrm{D}(\mathcal{C})$, then we have an exact sequence of abelian groups

$$\ldots \to \mathrm{Hom}_{\mathrm{D}(\mathcal{C})}(U, X[i]) \to \mathrm{Hom}_{\mathrm{D}(\mathcal{C})}(U, Y[i]) \to \mathrm{Hom}_{\mathrm{D}(\mathcal{C})}(U, Z[i]) \to \mathrm{Hom}_{\mathrm{D}(\mathcal{C})}(U, X[i+1]) \to \ldots$$

Theorem 10. $\mathrm{Ext}^0_{\mathcal{C}}(X, Y) = \mathrm{Hom}_{\mathcal{C}}(X, Y)$

Theorem 11. $\mathrm{Ext}^i_{\mathcal{C}}(X, Y) = 0$ *for $i < 0$.*

Theorem 12. *Every element in $\mathrm{Ext}^i_{\mathcal{C}}(X, Y)$ has a presentation $X[0] \xleftarrow{s} K \xrightarrow{f} Y[i]$, where $K_j = 0$ for $j < -i$ and for $j > 0$, $K_{-i} = Y$, $f_i = \mathrm{id}$, and s is a quasi-isomorphism.*

In other words, every such element comes from an exact sequence

$$0 \to Y = K^{-i} \to K^{-i+1} \to K^{-i+2} \to \ldots \to K^1 \to K^0 \to X \to 0.$$