Derived functors of $\mathcal{A} \xrightarrow{F} \mathcal{B}$ $\mathcal{A}, \mathcal{B}$ abelian

$P \xrightarrow{\sim} A$ projective resolution $\quad A \xrightarrow{\sim} E$ injective resolution

- F covariant right exact functor

  If $\mathcal{A}$ has enough projectives,

  the left derived functors of F are

  $$L_i F(A) := H_i(F(P))$$

- F covariant left exact functor

  If $\mathcal{A}$ has enough injectives,

  the right derived functors of F are

  $$R^i F(A) := H^i(F(E))$$

- F contravariant left exact functor

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  If $\mathcal{A}$ has enough injectives,

  the left derived functors of F are

  $$L_i F(A) := H_i(F(E))$$

original functor is	Exactness	Use	take	derived functor
Covariant	Right	projectives	H_i	Covariant
	Left	injectives	H^i	Covariant
Contravariant	Left	projectives	H^i	Contravariant
	Right	injectives	H_i	Contravariant