

# index of category theory\*

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2013-03-21 21:59:06

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|---------------------------------------|------------------------------------|
| <b>1 Foundations</b>                  | 17. initial source                 |
| <b>1.1 Basic Definitions</b>          | 18. final sink                     |
| 1. category theory                    | 19. isomorphism-closed subcategory |
| 2. precategory                        | 20. locally finite category        |
| 3. category                           | 21. preimage of category           |
| 4. alternative definition of category | 22. product of categories          |
| 5. subcategory                        | 23. types of morphisms             |
| 6. automorphism                       | 24. wellpowered category           |
| 7. commutative diagram                | 25. zero object                    |
| 8. concrete category                  | 26. $\mathcal{U}$ -small           |
| 9. dual category                      | 27. equalizer                      |
| 10. duality principle                 | 28. subobject                      |
| 11. endomorphism                      | 29. quotient object                |
| 12. epi                               | 30. categorical direct product     |
| 13. monic                             | 31. categorical direct sum         |
| 14. extremal monomorphism             | 32. categorical pullback           |
| 15. source                            | 33. direct limit                   |
| 16. sink                              | 34. limiting cone                  |

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\**IndexOfCategoryTheory* created: *(2013-03-21)* by: *(rspuzio)* version: *(38873)* Privacy setting: *(1)* *(Topic)* *(18-01)*

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- 35. complete category
- 36. groupoid (category theoretic)

## 1.2 Maps of Categories

- 1. functor
- 2. autofunctor
- 3. category isomorphism
- 4. diagonal functor
- 5. endofunctor
- 6. forgetful functor
- 7. identity functor
- 8. isomorphism
- 9. multifunctor
- 10. natural transformation
- 11. essentially surjective
- 12. faithful functor
- 13. full functor
- 14. natural equivalence
- 15. adjoint functor
- 16. equivalence of categories
- 17. isomorphic categories
- 18. universal property
- 19. representable functor
- 20. Equivalent definition of a Representable Functor
- 21. simplicial object

## 1.3 Fundamental Theorems

- 1. properties of monomorphisms and epimorphisms
- 2. properties of regular and extremal monomorphisms
- 3. monomorphisms are pullback stable
- 4. proof that an equalizer is a monomorphism
- 5. Yoneda lemma
- 6. categorical direct product is an inverse limit
- 7. kernel is an inverse limit

## 1.4 Examples of Categories

- 1. discrete category
- 2. category example (arrow category)
- 3. category associated to a partial order
- 4. category of matrices
- 5. Category of pseudomorphisms
- 6. Category of intermorphisms
- 7. examples of initial objects and terminal objects and zero objects
- 8. category of sets
- 9. monomorphisms of category of sets
- 10. monoid as a category
- 11. comma category
- 12. category of pointed topological spaces
- 13. simplicial category

## 1.5 Miscellaneous

1. algebra formed from a category
2. monad
3. comonad
4. monoidal category
5. group object
6. nerve
18. horseshoe lemma
19. syzygy
20. Ext
21. Tor
22. projective dimension
23. 5-lemma
24. proof of 5-lemma
25. 9-lemma

## 2 Additive Categories and Homology

1. preadditive category
2. additive category
3. Abelian category
4. supplemental axioms for an Abelian category
5. exact sequence
6. exact functor
7. Grothendieck spectral sequence
8. enough projectives
9. enough injectives
10. projective object
11. injective object
12. derived functor
13. derived category
14. Algebraic K-theory
15. examples of algebraic K-theory groups
16. Grothendieck group
17. delta functor
26. snake lemma
27. proof of snake lemma
28. chain homotopy
29. chain homotopy equivalence
30. chain map
31. homology of a chain complex
32. Leray spectral sequence
33. spectral sequence

## 3 Sheaves, Topoi, and the like

1. presheaf
2. sheaf
3. sheafification
4. presheaf of a topological basis
5. stalk
6. Étale space
7. resolution of a sheaf
8. site
9. small site on a scheme
10. topos
11. cosmos

12. subobject classifier

13. well-pointed topos

14. power object

15. natural numbers object

16. Cartesian closed category

17. exponential object