Yuka Umemoto

Part I: Algebraic Topology
References :
1. Bredon, Glen : Topology and Geometry
2. Greenberg, Marvin and John Harper : Algebraic Topology, a First Course
3. Rolfsen, Dale : Knots and Links

The following are taken from the references.

Fundamental Group (Bredon, Chapter III)
1. Homotopy Groups
2. The Fundamental Group
3. Covering Spaces
4. The Lifting Theorem
5. The Action of π_1 on the Fiber
6. Deck Transformations
7. Properly Discontinuous Actions
8. Classification of Covering Spaces
9. The Seifert-Van Kampen Theorem

Singular Homology Theory (Greenberg and Harper)
8. Affine Preliminaries
9. Singular Theory
10. Chain Complexes
11. Homotopy Invariance of Homology
12. Relation Between π_1 and H_1
13. Relative Homology
14. The Exact Homology Sequence
15. The Excision Theorem
16. Further Applications to Spheres
17. Mayer-Vietoris Sequence
18. The Jordan-Brower Separation Theorem
19. Construction of Spaces: Spherical Complexes
20. Betti Numbers and Euler Characteristic
21. Constuction of Spaces: Cell Complexes and More Adjunction Spaces

Orientation and Duality on Manifolds (Greenberg and Harper)
22. Orientation of Manifolds
23. Singular Cohomology
24. Cup and Cap Products
25. Algebraic Limits
26. Poincare Duality
27. Alexander Duality
28. Lefschetz Duality

Fundamental Group and Alexander Invariant of Knots (Rolfsen)
Chapter 3: The Fundamental Group
A. Knot and link invariants
B. The knot group
C. Torus knots
D. The Wirtinger presentation

Chapter 5: Seifert Surfaces
A. Surfaces and genus
C. Construction of the cyclic coverings of a knot complement using Seifert surfaces

Chapter 6: Finite Cyclic Coverings and Torsion Invariants
B. Calculation using Seifert surfaces

Chapter 7: Finite Cyclic Coverings and the Alexander Invariant
A. The Alexander invariant
B. Seifert surfaces again

Chapter 10: Foliations, Branched covers, Fibrations and so on
H. Fibered knots and links
I. Fibering the complement of a trefoil

Part II: Differential Geometry

Reference:
Boothby, William : An Introduction to Differentiable Manifolds and Riemannian Geometry

The following are taken from the reference.

Chapter III: Differentiable Manifolds and Submanifolds
1. The Definition of a Differentiable Manifold
2. Further Examples
3. Differentiable Functions and Mappings
4. Rank of a Mapping. Immersions
5. submanifolds
6. Lie Groups
7. The Action of a Lie Group on a Manifold. Transformation Groups
8. The Action of a Discrete Group on a Manifold
9. Covering Manifolds

Chapter IV: Vector Fields on a Manifold
1. The Tangent Space at a Point of a Manifold
2. Vector Fields
3. One-Parameter and Local One-Parameter Groups Acting on a Manifold
4. The Existence Theorem for Ordinary Differential Equations
5. Some Examples of One-Parameter Groups Acting on a Manifold
6. One-Parameter Subgroups of Lie Groups
7. The Lie Algebra of Vector Fields on a Manifold
8. Frobenius' Theorem
9. Homogeneous Spaces

Chapter V: Tensors and Tensor Fields on Manifolds
1. Tangent Covectors
2. Bilinear Forms. The Riemannian Metric
3. Riemannian Manifolds as Metric Spaces
4. Partition of Unity
5. Tensor Fields
6. Multiplication of Tensors
7. Orientation of Manifolds and the Volume Element
8. Exterior Differentiation

Chapter VII: Differentiation on Riemannian Manifolds
1. Differentiation of Vector Fields along Curves in $\mathbf{R^n}$
   The Geometry of Space Curves
   Curvature of Plane Curves
2. Differentiation of Vector Fields on Submanifolds of $\mathbf{R^n}$
   Formulas for Covariant Derivatives
   $\nabla_X Y$ and Differentiation of Vector Fields
3. Differentiation on Riemannian Manifolds
   Constant Vector Fields and Parallel Displacement
4. The Curvature Tensor The Riemannian Connection and Exterior Differential Forms
5. Geodesic Curves on Riemannian Manifolds
6. The Tangent Bundle and Exponential Mapping. Normal Coordinates

Chapter VIII: Curvature
1. The Geometry of Surfaces in $\mathbf{E^3}$
   Principle Curvatures at a Point of a Surface
2. The Gaussian and Mean Curvatures of a Surface
   The Theorema Egregium of Gauss

3. Basic Properties of the Riemannian Curvature Tensor
4. The Curvature Forms and the Equations of Structure
5. Differentiation of Covariant Tensor Fields
6. Manifolds of Constant Curvature
   Spaces of Positive Curvature
   Spaces of Zero Curvature
   Spaces of Constant Negative Curvature