

(2) 미분(Differentiation)

a. Differential Calculus (약 2h)

(<https://www.khanacademy.org/math/differentialcalculus>)

i. Derivative introduction

1. Derivative as slope of curve (6m)
2. Derivative & the direction of a function (3m)
3. The graphical relationship between a function & its derivative(part1,part2) (12m)

ii. Basic differentiation

1. Basic differentiation rules(7m)
2. Power rule (4m) (선택)
3. Differentiating polynomials (10m)
4. Negative powers differentiation (5m)
5. Fractional powers differentiation (3m)
6. Radical functions differentiation intro (3m)
7. Derivatives of $\sin(x)$, $\cos(x)$, $\tan(X)$, e^x & $\ln(x)$ (4m)

iii. Product, quotient, & chain rules

1. Differentiating products (4m)
2. Differentiating products of more than two functions (4m)
3. Chain rule introduction (5m)
4. Differentiating composite functions 1,2,3 (20m)
5. Quotient rule from product & chain rules (5m)

iv. Differentiating common functions

1. Rational functions differentiation (7m)
2. Radical functions differentiation (6m)
3. Derivatives of $\tan(x)$ and $\cot(x)$ (5m) (선택)
4. Derivatives of $\sec(x)$ and $\csc(x)$ (4m) (선택)
5. Trig functions differentiation (7m) (선택)

v. Advanced differentiation (난이도 ★★★) (선택)

b. Multivariable Calculus (약 0.5h)

(<https://www.khanacademy.org/math/multivariablecalculus>)

i. Thinking about multivariable functions

1. Multivariable functions (6m)

ii. Derivatives of multivariable functions

1. Partial derivatives, introduction (11m)
2. Graphical understanding of partial derivatives (7m) (선택)
3. Formal definition of partial derivatives (8m) (선택)
4. Gradient (6m)

(3) 선형대수(Linear Algebra)

a. Vectors (1.5h)

(<https://www.khanacademy.org/math/algebrahome/algvectors>)

i. Vector basics

1. Intro to vectors & scalars (8m)
2. Equivalent vectors (2m)
3. Components of vectors (6m)
4. Components of vectors (example 2) (3m)

ii. Magnitude of vectors

1. Magnitude of a vector from graph (3m)
2. Magnitude of a vector from components (3m)
3. Magnitude of a vector from initial & terminal points (3m)

iii. Scalar multiplication

1. Scalar multiplication of vectors (5m)
2. Analyzing scalar multiplication (5m)

iv. Vector addition & subtraction

1. Adding & subtracting vectors (7m)
2. Graphically adding & subtracting vectors (6m)
3. Adding vectors algebraically & graphically (7m)

v. Combined vector operations

1. Combined vector operations (6m)

vi. Unit vectors

1. Worked example: finding unit vector with given direction (5m)
2. Unit vectors intro (8m)
3. Worked example: Scaling unit vectors (3m)

vii. Component form of vectors

1. Vector components from magnitude & direction (10m)

viii. Adding vectors in magnitude & direction form (난이도: ★★)

1. Adding vectors in magnitude & direction form (1 of 2) (9m)
2. Adding vectors in magnitude & direction form (2 of 2) (8m)

b. Matrices (2.5h)

(<https://www.khanacademy.org/math/algebrahome/algmatrices>)

i. Introduction to matrices

1. Intro to matrices (4m)

ii. Adding & subtracting matrices

1. Adding & subtracting matrices (5m)

iii. Multiplying matrices by scalars

1. Multiplying matrices by scalars (12m)

iv. Multiplying matrices by matrices

1. Intro to matrix multiplication (6m)
2. Multiplying matrices (5m)

v. Properties of matrix multiplication

1. Defined matrix operations (3m)
2. Intro to identity matrix (8m)

3. Dimensions of identity matrix (3m)
4. Is matrix multiplication commutative? (7m)
5. Associative property of matrix multiplication (8m)
6. Zero matrix & matrix multiplication (4m)
7. Using properties of matrix operations (3m)
8. Using identity & zero matrices (4m)
- vi. Matrices as transformations
 1. Transforming vectors using matrices (4m)
 2. Transforming polygons using matrices (7m)
 3. Visual representation of transformation from matrix (6m)
- vii. Determinant of a 2x2 matrix
 1. Determinant of a 2x2 matrix (1m)
- viii. Introduction to matrix inverses
 1. Intro to matrix inverses (14m)
 2. Determining invertible matrices (14m)
- ix. Determinants & inverses of large matrices (난이도: ★★★★★)
 1. Determinant of a 3x3 matrix: standard method (1 of 2) (4m)
 2. Determinant of a 3x3 matrix: shortcut method (2 of 2) (2m)
 3. Inverting a 3x3 matrix using Gaussian elimination (13m)
 4. Inverting a 3x3 matrix using determinants Part 1: Matrix of minors and cofactor matrix (8m)
 5. Inverting a 3x3 matrix using determinants Part 2: Adjugate matrix (6m)
- x. Solving equations with inverse matrices (난이도: ★★★★★)
 1. Representing linear systems with matrix equations (10m)
 2. Solving linear systems with matrix equations (6m)

c. Vectors and spaces (2.2h) (난이도: ★★★★★)

(<https://www.khanacademy.org/math/linearalgebra/vectorsandspace>)

i. Vectors

1. Vector intro for linear algebra (5m)
2. Real coordinate spaces (6m)
3. Parametric representations of lines (25m)

ii. Linear combinations and spans

1. Linear combinations and span (20m)

iii. Linear dependence and independence

1. Introduction to linear independence (15m)
2. More on linear independence (17m)

iv. Vector dot and cross products

1. Vector dot product and vector length (9m)
2. Defining the angle between vectors (25m)

v. Matrix vector products

1. Matrix vector products (21m)

d. Matrix transformations (약 2.3h)

(<https://www.khanacademy.org/math/linearalgebra/matrixtransformations>)

i. Linear transformation examples

1. Introduction to projections (14m)
- ii. Transformations and matrix multiplication
 1. Matrix product examples (18m)
- iii. Finding inverses and determinants
 1. Example of finding matrix inverse (6m)
 2. Formula for 2×2 inverse (18m)
 3. 3×3 determinant (10m)
 4. $n \times n$ determinant (18m) (선택)
 5. Determinants along other rows/cols (9m) (선택)
 6. Rule of Sarrus of determinants (7m) (선택)
- iv. Transpose of a matrix
 1. Transpose of a matrix (8m)
 2. Transpose of a matrix product (8m)
 3. Transposes of sums and inverses (8m)
 4. Transpose of a vector (12m)