

# VCE Specialist Mathematics 3/4 Curriculum and Khan Academy Links

## Three-dimensional vectors

3D Cartesian coordinates  
3D Vectors  
Scalar and Vector product  
Cartesian Geometry  
Equations of planes  
Systems of linear equations

<https://www.khanacademy.org/math/algebra-home/alg-vectors>

## Complex numbers and De Moivre's Theorem

Complex number operations  
Polar Form  
Modulus/Argument and principal value  
Operations in polar form  
De Moivre's theorem  
Addition/Subtraction/ Multiplication/Division in the complex plane  
Complex number operations as transformations  
Graphing in the complex plane

<https://www.khanacademy.org/math/algebra2/introduction-to-complex-numbers-algebra-2>

## Functions and sketching graphs

Composition of functions  
One-to-one functions  
Inverse functions  
Absolute value functions  
Graphs of  $y=f(x)$ ,  $y=1/f(x)$ ,  $y=f(|x|)$   
Rational functions

<https://www.khanacademy.org/math/algebra2/rational-expressions-equations-and-functions>

## Vector Calculus

Vector equations in the plane  
Derivatives of vector functions in the plane  
Integrals of vector functions in the plane

<https://www.khanacademy.org/math/multivariable-calculus/thinking-about-multivariable-function#visualizing-vector-valued-functions>

## Complex roots and polynomials

Roots of unity  
Roots of complex numbers  
Complex polynomials  
Remainder and factor theorems  
Solution of polynomial equations with real coefficients  
Solution of complex polynomial equations

<https://www.khanacademy.org/math/algebra2/polynomial-functions#polynomial-identities-with-complex-numbers>

## Integration techniques

Integration using trigonometric identities

<https://www.khanacademy.org/math/integral-calculus/ic-integration#ic-integration-with-trig-identities>

Integration by substitution

<https://www.khanacademy.org/math/integral-calculus/ic-integration#ic-u-sub>

Integration of  $x^{-1}$

Inverse trigonometric functions

Integration using partial fractions

<https://www.khanacademy.org/math/integral-calculus/ic-integration#ic-partial-frac>

Integration by parts

<https://www.khanacademy.org/math/integral-calculus/ic-integration#ic-integration-by-parts>

## Rates of change and differential equations

Implicit differentiation

Related rates of change

$dy/dx = f(x)$

$dy/dx = g(y)$

First-order differential equations with separable variables

Logistic equation

<https://www.khanacademy.org/math/differential-calculus/dc-chain>

<https://www.khanacademy.org/math/differential-equations/first-order-differential-equations>

## Applications of integration

Areas between curves

<https://www.khanacademy.org/math/integral-calculus/ic-int-app#ic-vertical-area>

Volumes of solids of revolution

<https://www.khanacademy.org/math/integral-calculus/ic-int-app#ic-disc-method-axes>

Numerical integration

Exponential probability density function

## Statistical Inference

Sample means

Sampling distribution simulations

Mean/SD of Sample means

<https://www.khanacademy.org/math/statistics-probability/sampling-distributions-library>

Confidence intervals for normal distributions

<https://www.khanacademy.org/math/statistics-probability/confidence-intervals-one-sample>

Estimation of population parameters

Survey procedures, confidence intervals and data quality

## Physics Related

Straight-line motion

Motion with constant acceleration

Motion with varying acceleration

Force, momentum and motion

Motion in a straight line with constant force

Motion in a straight line with variable forces

Simple harmonic motion

<https://www.khanacademy.org/science/physics/mechanical-waves-and-sound#simple-harmonic-motion-with-calculus>

<https://www.khanacademy.org/science/physics/one-dimensional-motion>

<https://www.khanacademy.org/science/physics/forces-newtons-laws>