Mathematical formulae

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# Percentage

is start amount

n is number of years(dates)

K is the amount n dates later

r is the interest (growth rate)

Is called the growth factor.

# Rules for parenthesis

# Powerrules

# Log rules

The same rules apply for natural logaritm

|  |  |
| --- | --- |
| WordMat|0.992|||||0|5|-1|2|ln(x)|x|||-1||x|||-1||x|||-1||x|||-1||x|||-1||x|||-1||||||||||||||||||e ; 1|False|False|1,2|1,2||e;2,8;-0,08|False|False|False|False| | **The graph of ln(x)**  Only defined for x>0  Vertical asymptote at x=0  Interesect x-axis at  Approached infinity for  Passes through the point (e,1) |

|  |  |
| --- | --- |
| WordMat|0.992|||||0|12|-1|2|log(x)|x|||-1||x|||-1||x|||-1||x|||-1||x|||-1||x|||-1||||||||||||||||||10;1|False|False|1,2|1,2||1;1;-0.1|False|False|False|False| | **Graph of log(x)**  Only defined for x>0  Vertical asymptote at x=0  Interesect x-axis at  Approached infinity for  Passes through the point (10,1) |

# Functions

**Linear function**

|  |  |
| --- | --- |
|  | Equation    a is slope (gradient)  b is the y-intercept |

You can determine the slope if you know two points on the graph. and

The equation for the tangent

Linear function written as a linear equation

is the normal vector to the line passing through the point

**Exponential function**

|  |  |
| --- | --- |
|  | Function    a is the growth rate  b is the start value (y-intercept) |

a can be determined if you know two points on the graph og

Doubling constant

half-constant

**Power function**

|  |  |
| --- | --- |
|  | Function  , |

a can be determined if you know two points on the graph og

Power growth is percentage-percentage growth. If the x-value increases by growth rate , then the y-value will will always increase by a another fixed growth rate .

Using growth factors

**Polynomials**

Polynomium degree n

First degree polynomium (linear function)

2. degree polynomium

Zeros (roots)

Where d is the diskriminant

**Trigonometric function**

|  |  |
| --- | --- |
| v  x  1 | **Unit circle**  Arclength x is the angle v in radians |

|  |  |
| --- | --- |
| Cos(x)  sin(x)  x | **Definition of cosinus and sinus** |

**Trigonometric identities**

|  |  |  |
| --- | --- | --- |
|  | cos(x) is periodic  cos(x) is symmetrical | |
|  | | sin(x) is periodic  sin(x) is antisymmetrical | |

# Calculus

Definition of differential kvotient

Rules for differentiation

**Function Derived function**

ln(x)

**Function Antiderivative**

ln|x|

**Rules of integration**

*Indefinte integral*  
F(x) is the antiderivative of f(x)

Integration by substitution , hvor t=g(x)

*Definite integral*

Integration by substitution

# Differential equations

**Equation Solution**

dx

Where A(x) is the antiderivative of a(x)

# Geometry

**Similar triangles**

A

B

C

a

b

c

A₁

B₁

C₁

a₁

b₁

c₁

k is the scale factor

**Right angled triangles**

A

B

C

a

b

c

Pythagoras

cos, sin & tan in right angled triangles

**General triangles**

A

B

C

a

b

c

Sine rule

Cosine rule

Area of a triangle

**Circles**

Area of a circle

Circumference

**2D Geometry**

Distance between two points og

Middle point between two points og

# Vectors in 2D

Magnitude (Length) of

Rules

|  |  |
| --- | --- |
| v | **Scalar product** (dot product)  v is the angle between and |

|  |  |
| --- | --- |
|  | **Orthogonal** vectors  (right angled) |

|  |  |
| --- | --- |
|  | **Projection** of on  Magnitude of projection |

|  |  |
| --- | --- |
|  | **xxx vector** to |

|  |  |
| --- | --- |
| v | **Determinant**    v is the angle between and  Parallel vectors |

|  |  |
| --- | --- |
| v | Area of parallelogram spanned by and |

# Vectors in 3D

Most definitions and rules from vectors in 2D also apply in 3D. Just apply an extra coordinate.

Determinant for two 3D vectors is not possible though

The following definitions and rules only apply to 3D

|  |  |
| --- | --- |
| v | **Vector product** (cross product)  Magnitude |
| v | Magnitude of vector produkt equals the area of the **parallelogram** spanned by and |

# Geometry in 3D

**Lines in space**

|  |  |
| --- | --- |
| l | **vector equation for line** l through the point with direction vector |

|  |  |
| --- | --- |
| l  P | **Distiance from point P to line l** passing through the point with direction vector |

**Planes in space**

|  |  |
| --- | --- |
| α  P0 | The equation the the plane α through the point with normal vector |

|  |  |
| --- | --- |
| α  P | Distance from point to plane α through the point with normal vector  Distance from point to plane α with equation |

**Sphere**

|  |  |
| --- | --- |
| C  r | The equation for a sphere of center and radius r |

# Probability

**Permutations**

The number of ways you can extract r elements from a set of n elements, if the order is important.

**Combinations**

The number of ways you can extract r elements from a set of n elements, if the order is *not* important.

Binomial coefficient:

**Mean value**

**Standard deviation**

**Binomial distribution**

Probability for r no. of succes’ in n binomial experiments with base probability p

Cumulative

Mean

Standard deviation

**Normal distribution**

Probability density function

Cumulative distribution function