The single variable calculus 5×5 checklist

Geometry:

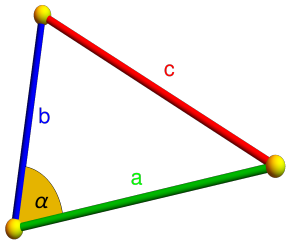
Types of triangles: right triangle, isosceles

Pythagoras theorem $a^2 + b^2 = c^2$

cos-formula $c^2 = a^2 + b^2 - 2ab\cos(\alpha)$

sin-formula $a/\sin(\alpha) = b/\sin(\beta) = c/\sin(\gamma)$

Equations of lines, circles, ellipses, hyperbola



Functions:

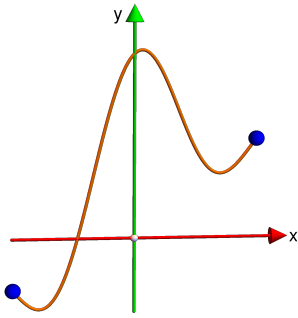
Functions, notation like x^n, $x^{-3/4}$ $(1+x)^n$, 2^x

Square roots and higher order roots $\sqrt[n]{x}$

The natural logarithm $\log(x) = \ln(x)$

The exponential function e^x **and** $a^x = e^{x\log(a)}$

Trig functions $\sin, \cos, \tan$ **and their inverses**



Algebra:

Solving linear and quadratic equations while asleep

Add, multiply, divide and factor polynomials

Use exponentials like $e^a e^b = e^{a+b}$, $(e^a)^b = e^{ab}$

Trigonometric identities like $\sin^2(x) + \cos^2(x) = 1$, $\cos^2(x) = (1 + \cos(2x))/2$

Identities $\log(xy) = \log(x) + \log(y)$,$\log(a^b) = b\log(a)$

Derivatives:

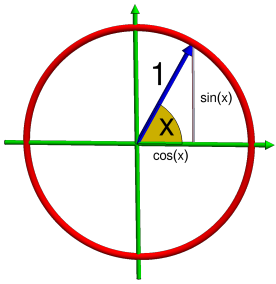
Mechanisms for discontinuity, Hôpital

Leibniz quotient and chain rule

Finding extrema using first derivative test

Find critical point using second derivative test

Taylor formula $f(x) = f(0) + f'(0)x + f''(0)x^2/2 + \ldots$



Integrals:

Integration by parts like $\int x^5 \cos(x) dx$

Integration by substitution like $\int \log(x)/x dx$

Partial fractions like $2/(1-x^2) = 1/(1+x) + 1/(1-x)$

Convergence of $\int_0^1 x^s\, dx$ **or** $\int_1^\infty x^s dx$

Fundamental theorem of calculus

$\int_0^x f'(t)\, dt = f(x) - f(0)$ $\qquad$ $(\int_0^x f(t)\, dt)' = f(x)$