

Advanced Higher Mathematics

The knowledge and skills required to meet each assessment standard is detailed below together with the *Added Value skills*.

Methods in Algebra and Calculus

1.1 Applying algebraic skills to partial fractions	VG	OT	NS
Express a proper rational function as a sum of partial fractions.			
<i>Reduce an improper rational function to a polynomial and a proper rational function.</i>			
Assessment mark			P/F

1.2 Applying calculus skills through techniques of differentiation	VG	OT	NS
Differentiate functions including polynomials, $\sin x$, $\cos x$, $\tan x$, $\sec x$, $\operatorname{cosec} x$, $\cot x$, e^x and $\ln x$.			
Differentiate functions using the chain rule			
Differentiate functions using the product rule			
Differentiate functions using the quotient rule			
Use above rules to differentiate functions requiring more than one application.			
<i>Use logarithmic differentiation.</i>			
Differentiate an inverse trig function.			
Use implicit differentiation to find first and <i>second derivatives</i> .			
Use parametric differentiation to find first and <i>second derivatives</i> .			
<i>Solve practical problems involving rates of change.</i>			
Assessment mark			P/F

1.3 Applying calculus skills through techniques of integration	VG	OT	NS
Integrate expressions using standard results: $\int x^n dx = \frac{x^{n+1}}{n+1} + c, n \neq -1$ $\int \sec^2 x dx = \tan x + c$ $\int \sin x dx = -\cos x + c$ $\int e^x dx = e^x + c$ $\int \cos x dx = \sin x + c$ $\int \frac{1}{x} dx = \ln x + c$ $\int \frac{1}{\sqrt{1-x^2}} dx = \sin^{-1} x + c$ $\int \frac{1}{1+x^2} dx = \tan^{-1} x + c$			
Integrate functions using a substitution.			
Prove standard integrals by substitution: $\int f(ax+b) dx = \frac{1}{a} F(ax+b) + c$ where F is the antiderivative of f , and $\int \frac{f'(x)}{f(x)} dx = \ln f(x) + c$.			
Integrate rational functions by writing in partial fractions.			
Integrate by parts <i>including more than one application</i> .			
Assessment mark			P/F

1.4 Applying calculus skills to solving differential equations	VG	OT	NS
Recognise differential equations and understand the terms linear, order, general solution, arbitrary constant, particular solution and initial conditions .			
Solve first order differential equations with separable variables.			
Solve first order linear differential equations using the integrating factor method and find particular solutions.			
Solve second order homogenous ODEs with constant coefficients, finding the general solution in each of the <i>three cases</i> .			
<i>Solve second order non-homogeneous ODEs with constant coefficients using the auxiliary equation and particular integral method.</i>			
Assessment mark			P/F