

Achievement Standard

Subject Reference	Mathematics and Statistics 2.7		
Title	Apply calculus methods in solving problems		
Level	2	Credits	5
		Assessment	External
Subfield	Mathematics		
Domain	Calculus		
Status	Registered	Status date	17 November 2011
Planned review date	31 December 2018	Date version published	5 February 2015

This achievement standard involves applying calculus methods in solving problems.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
<ul style="list-style-type: none"> Apply calculus methods in solving problems. 	<ul style="list-style-type: none"> Apply calculus methods, using relational thinking, in solving problems. 	<ul style="list-style-type: none"> Apply calculus methods, using extended abstract thinking, in solving problems.

Explanatory Notes

- This achievement standard is derived from Level 7 of *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007; and is related to the achievement objectives

 - sketch the graphs of functions and their gradient functions and describe the relationship between these graphs
 - apply differentiation and anti-differentiation techniques to polynomials in the Mathematics strand of the Mathematics and Statistics Learning Area. It is also related to the material in the *Teaching and Learning Guide for Mathematics and Statistics*, Ministry of Education, at <http://seniorsecondary.tki.org.nz>.

This standard is also derived from *Te Marautanga o Aotearoa*. For details of *Te Marautanga o Aotearoa* achievement objectives to which this standard relates, see the [Papa Whakaako](#) for the relevant learning area.
- Apply calculus methods in solving problems* involves:

 - selecting and using methods
 - demonstrating knowledge of calculus concepts and terms
 - communicating using appropriate representations.

Relational thinking involves one or more of:

- selecting and using a logical sequence of steps
 - connecting different concepts or representations
 - demonstrating understanding of concepts
 - forming and using a model;
- and also relating findings to a context, or communicating thinking using appropriate mathematical statements.

Extended abstract thinking involves one or more of:

- devising a strategy to investigate a situation
- demonstrating understanding of abstract concepts
- developing a chain of logical reasoning, or proof
- forming a generalisation;

and also using correct mathematical statements, or communicating mathematical insight.

- 3 *Problems* are situations which provide opportunities to apply knowledge or understanding of mathematical concepts and methods. Situations will be set in real-life or mathematical contexts.
- 4 Methods include a selection from those related to:
- derivatives and anti-derivatives of polynomials given in expanded form
 - gradient functions
 - gradient at a point
 - equation of a tangent
 - turning points where $f'(x) = 0$ and their nature
 - function from a derived function
 - rate of change problems (such as kinematics).
- 5 Assessment Specifications for this achievement standard can be accessed through the Mathematics and Statistics Resources page found at <http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/ncea-subject-resources/>.
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Replacement Information

This achievement standard replaced AS90286, AS90807, unit standard 5244, unit standard 5260, and unit standard 5261.

Quality Assurance

- 1 Providers and Industry Training Organisations must have been granted consent to assess by NZQA before they can register credits from assessment against achievement standards.
- 2 Organisations with consent to assess and Industry Training Organisations assessing against achievement standards must engage with the moderation system that applies to those achievement standards.