



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **MEM23002A Apply calculus in engineering situations**

**Release: 1**

## MEM23002A Apply calculus in engineering situations

### Modification History

Not Applicable

### Unit Descriptor

<b>Unit descriptor</b>	This unit covers applying concepts of calculus to engineering situations.
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### Application of the Unit

<b>Application of the unit</b>	<p>This unit applies to selecting and applying calculus techniques to resolve engineering problems. It includes finding derivatives from first principles, using rules of derivatives to find first and second derivatives of functions; applying integral calculus to functions; applying differential and integral calculus to engineering problems.</p> <p>This unit only has application in qualifications that are not points based.</p> <p><b>Band: 0</b></p> <p><b>Unit Weight: 0</b></p>
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### Licensing/Regulatory Information

Not Applicable

## Pre-Requisites

<b>Prerequisite units</b>		
<b>Path 1</b>	MEM30012A	Apply mathematical techniques in manufacturing, engineering or related situations

## Employability Skills Information

<b>Employability skills</b>	This unit contains employability skills.
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## Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.
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## Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Apply differentiation techniques to engineering applications	1.1. Solve engineering problems using the rules of differentiation.
2. Apply integration techniques to engineering applications	2.1. Use integration techniques to obtain integrals of algebraic, trigonometric and exponential functions and evaluate definite integrals. 2.2. Solve engineering problems using the rules of integration.

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

#### Required skills

- Look for evidence that confirms skills in:
- solving engineering problems using the principles of differentiation
- obtaining first and second derivatives of algebraic, trigonometric, exponential and logarithmic functions
- obtaining integrals of algebraic, trigonometric and exponential functions
- evaluating definite integrals
- solving engineering problems using the principles of integration

#### Required knowledge

Look for evidence that confirms knowledge of:

- the rules of differentiation
- the concept of implicit and explicit functions
- the Newton's method for solving equations
- the procedures for determining the following
- equations of tangents and normals
- stationary points and curve sketching
- rates of change
- rectilinear motion
- maxima and minima
- the concept of integration being the inverse of differentiation

**REQUIRED SKILLS AND KNOWLEDGE**

- the procedures for obtaining the integral of a function
- the rules of integration
- applications of Simpson's rule
- areas between curves
- distance travelled
- rectilinear motion

## Evidence Guide

<b>EVIDENCE GUIDE</b>	
<p>The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.</p>	
<p><b>Overview of assessment</b></p>	<p>A person who demonstrates competency in this unit must be able to apply calculus in engineering situations. Competency in this unit cannot be claimed until all prerequisites have been satisfied.</p>
<p><b>Critical aspects for assessment and evidence required to demonstrate competency in this unit</b></p>	<p>Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.</p>
<p><b>Context of and specific resources for assessment</b></p>	<p>This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.</p> <p>This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with applying calculus in engineering situations or other units requiring the exercise of the skills and knowledge covered by this unit.</p>
<p><b>Method of assessment</b></p>	<p>Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.</p>

**EVIDENCE GUIDE**

<b>Guidance information for assessment</b>	
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**Range Statement****RANGE STATEMENT**

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

<b>Calculation aids/devices</b>	Computer and microprocessor driven devices may be used to assist with the performance of calculations
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**Unit Sector(s)**

<b>Unit sector</b>	
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**Co-requisite units**

<b>Co-requisite units</b>	

## Competency field

Competency field	Engineering science
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