Introduction to integration

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Summary

The idea of integration…

*Before reading this guide, it is recommended that you read [Guide: Properties of functions],* [*Guide: Laws of indices*](lawsofindices.qmd)*,* [*Guide: Logarithms*](logarithms.qmd)*, and [Guide: Tangents].*

# What is integration

This guide will look at the idea of differentiation; where it comes from, how it can be used, and how you can apply its techniques to functions that you may be familiar with.

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| --- | --- |
|  | **Example 4**  Determine the behaviour of the function when .  Here, you will first need to differentiate the function to find . Then, you will need to evaluate the derivative when to see how the function behaves.  Using your rules of differentiation as you found above, you can say that the derivative of is , and the derivative of is . Therefore, the derivative of the function is  You can evaluate the derivative at to get  and so the derivative is positive at . This implies that the function is increasing at the point .  It also means that the gradient of the tangent to the function at the point is . You can see this in the figure below. |

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| Figure 1: The graph of , with the tangent to the graph at illustrated, demonstrating that the function is increasing at . |

## Summary

Here’s a table of derivatives that you should remember going into any further reading on differentiation. Here, are any real numbers.

| Function | Derivative | Notes |
| --- | --- | --- |
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# Quick check problems

1. Answer the following questions true or false:
2. The derivative of a function at is equal to the gradient of the tangent to at .
3. If , then the function is increasing at .
4. If , then the derivative .
5. The derivative of is .
6. The derivative of is .
7. The power of in the derivative of is .
8. Differentiate the following functions with respect to .

# Further reading

[For more questions on the subject, please go to Questions: Introduction to differentiation and the derivative.](../questions/qs-introtodifferentiation.qmd)

For more about techniques of differentiation, please see [Guide: The product rule], [Guide: The quotient rule], and [Guide: The chain rule].

For more about where the derivatives in the above table come from, please see [Proof sheet: Derivatives of functions from first principles](../proofsheets/ps-introtodifferentiation.qmd) and [Proof sheet: Derivatives of other common functions]. For more about why the rules of differentiation are true, please see [Proof sheet: Rules of differentiation].

## Version history

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