

# Questions: The product rule

Sara Delgado Garcia

## Summary

A selection of questions for the study guide on the product rule.

*Before attempting these questions, it is highly recommended that you read [Guide: The product rule](#).*

In this question set, the following definitions are used:

$$\cosh(x) = \frac{e^x + e^{-x}}{2} \quad \text{and} \quad \sinh(x) = \frac{e^x - e^{-x}}{2}$$

These are **hyperbolic trigonometric functions**; for more about these, see [Guide: Introduction to hyperbolic functions].

Differentiate the following functions using the product rule.

- 1.1.  $xe^x$
- 1.2.  $x^2e^{2x}$
- 1.3.  $5x^3 \tan(x) \cos(x)$
- 1.4.  $x \ln(x)$
- 1.5.  $(x^3 + x^2 - 5)(x + 1)$
- 1.6.  $(13x^2 + 5x + 2)(x^3 + 2)$
- 1.7.  $x(5x^2 + 3x + 2)(x^2 + x + 1)$
- 1.8.  $(10x^2 + 21) \cos(x)$
- 1.9.  $\cosh(2x) \sinh(3x)$
- 1.10.  $(x^2 + 3) \ln(x)$
- 1.11.  $\sin(x)\sqrt{x}$
- 1.12.  $\cosh(x) \ln(x)$
- 1.13.  $x^2\sqrt{x} + x^2 \cos(x)$
- 1.14.  $e^{-5x}(x^3 + 5)$
- 1.15.  $\cos(x) \ln(x)$

- 1.16.  $\ln(x) \ln(3x) \ln(100x)$   
1.17.  $(x^2 + 5x + 2) \sin(x)$   
1.18.  $-\ln(x) \ln(3x)$   
1.19.  $(x^5 + 3)(x^2 + 3x)(x^7 + x^4)$   
1.20.  $(\sin(x) + 3x)e^{-x}$
- 

[After attempting the questions above, please click this link to find the answers.](#)

---

## Version history and licensing

v1.0: initial version created 05/25 by Sara Delgado Garcia as part of a University of St Andrews VIP project.

[This work is licensed under CC BY-NC-SA 4.0.](#)