Questions: The product rule

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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.*](../studyguides/productrule.qmd)*.*

In this question set, the following definitions are used:

$$cosh\left(x\right)=\frac{e^{x}+e^{−x}}{2}  and  sinh\left(x\right)=\frac{e^{x}−e^{−x}}{2}$$

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^{2}e^{2x}$

1.3. $ 5x^{3}tan\left(x\right)cos\left(x\right)$

1.4. $ xln\left(x\right)$

1.5. $ \left(x^{3}+x^{2}−5\right)\left(x+1\right)$

1.6. $ \left(13x^{2}+5x+2\right)\left(x^{3}+2\right)$

1.7. $ x\left(5x^{2}+3x+2\right)\left(x^{2}+x+1\right)$

1.8. $ \left(10x^{2}+21\right)cos\left(x\right)$

1.9. $ cosh\left(2x\right)sinh\left(3x\right)$

1.10 $ \left(x^{2}+3\right)ln\left(x\right)$

1.11 $ sin\left(x\right)\sqrt{x}$

1.12 $ cosh\left(x\right)ln\left(x\right)$

1.13. $ x^{2}\sqrt{x}+x^{2}cos\left(x\right)$

1.14. $ e^{−5x}\left(x^{3}+5\right)$

1.15. $ cos\left(x\right)ln\left(x\right)$

1.16. $ ln\left(x\right)ln\left(3x\right)ln\left(100x\right)$

1.17. $ \left(x^{2}+5x+2\right)sin\left(x\right)$

1.18. $ −ln\left(x\right)ln\left(3x\right)$

1.19. $ \left(x^{5}+3\right)\left(x^{2}+3x\right)\left(x^{7}+x^{4}\right)$

1.20. $ \left(sin\left(x\right)+3x\right)e^{−x}$

[After attempting the questions above, please click this link to find the answers.](../answers/as-productrule.qmd)

## 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.

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