

# Answers: The quotient rule

Sara Delgado Garcia

## Summary

Answers to questions relating to the guide on the quotient rule.

These are the answers to [Questions: The quotient rule](#).

**Please attempt the questions before reading these answers!**

---

$$1.1. \quad \frac{d}{dx} \left( \frac{e^x}{x} \right) = \frac{e^x(x-1)}{x^2}.$$

---

$$1.2. \quad \frac{d}{dx} \left( \frac{e^{7x}}{x^5} \right) = \frac{(7x-5)e^{7x}}{x^6}.$$

---

$$1.3. \quad \frac{d}{dx} \left( \frac{\ln(x)}{x^2} \right) = \frac{1-2\ln(x)}{x^3}$$

---

$$1.4. \quad \frac{d}{dx} \left( \frac{e^{-x}}{x^2+11x-2} \right) = -\frac{(x^2+13x+9)e^{-x}}{(x^2+11x-2)^2}$$

---

$$1.5. \quad \frac{d}{dx} \left( \frac{x^3+5x-5}{x^2+3} \right) = \frac{(3x^2+5)(x^2+3) - (x^3+5x-5)(2x)}{(x^2+3)^2}.$$

---

$$1.6. \quad \frac{d}{dx} \left( \frac{\cos(x)}{x^2+3x-1} \right) = \frac{-\sin(x)(x^2+3x-1) - \cos(x)(2x+3)}{(x^2+3x-1)^2}.$$

---

$$1.7. \quad \frac{d}{dx} \left( \frac{\tan(x)}{\cos(x)} \right) = \frac{\sec^2(x) \cos(x) + \tan(x) \sin(x)}{\cos^2(x)}$$


---

$$1.8. \quad \frac{d}{dx} \left( \frac{\ln(3x)}{\ln(5) + x} \right) = \frac{1}{x(\ln(5) + x)} - \frac{\ln(3x)}{(\ln(5) + x)^2}$$


---

$$1.9. \quad \frac{d}{dx} \left( \frac{x^2 + 3x}{\cos(x)} \right) = \frac{(2x + 3) \cos(x) + (x^2 + 3x) \sin(x)}{\cos^2(x)}$$


---

$$1.10. \quad \frac{d}{dx} \left( \frac{\ln(x)}{x^3 + 3} \right) = \frac{(x^3 + 3) - 3x^3 \ln(x)}{x(x^3 + 3)^2}$$


---

$$1.11. \quad \frac{d}{dx} \left( \frac{5 \tan(x)}{x} \right) = \frac{5x \sec^2(x) - 5 \tan(x)}{x^2}.$$


---

$$1.12. \quad \frac{d}{dx} \left( \frac{3x^7 - 27x^2 + 2\sqrt{x}}{x^2 + 1} \right) = \frac{15x^8 \sqrt{x} + 21x^6 \sqrt{x} - 54x \sqrt{x} - 4x^2 + x^2 + 1}{\sqrt{x}(x^2 + 1)^2} ..$$


---

$$1.13. \quad \frac{d}{dx} \left( \frac{e^{-3x}}{e^{2x}} \right) = \frac{-3e^{-3x} e^{2x} - 2e^{-3x} e^{2x}}{e^{4x}} = -5e^{-5x}.$$


---

$$1.14. \quad \frac{d}{dx} \left( \frac{e^3 x^3}{e^x} \right) = \frac{3e^{3+x} x^2 - e^{3+x} x^3 e^x}{e^{2x}} = \frac{x^2 e^{x+3} (3 + x)}{e^{2x}}.$$


---

$$1.15. \quad \frac{d}{dx} \left( \frac{x^5}{x^5 + 1} \right) = \frac{5x^4(x^5 + 1) - x^5(5x^4)}{(x^5 + 1)^2} = \frac{x^4}{(x^5 + 1)^2}$$


---

$$1.16. \quad \frac{d}{dx} \left( \frac{\tan(x)}{\ln(x)} \right) = \frac{x \sec^2(x) \ln(x) - \tan(x)}{x(\ln(x))^2}.$$

---

$$1.17. \quad \frac{d}{dx} \left( \frac{3 \sin(x)}{\ln(x)} \right) = \frac{3x \cos(x) \ln(x) - 3 \sin(x)}{x(\ln(x))^2}$$

---

$$1.18. \quad \frac{d}{dx} \left( \frac{\tan(x) + 5x}{\sec(3x)} \right) = \frac{\sec^2(x) + 5 - (3 \tan(3x))(5x + \tan(x))}{\sec(3x)}.$$

---

---

## 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.](#)