Answers: The quotient rule

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Summary

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

*These are the answers to* [*Questions: The quotient rule*](../questions/qs-quotientrule.qmd)*.*

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

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

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

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

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

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

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

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

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

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

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

1.11. $ \frac{d}{dx}\left(\frac{5tan\left(x\right)}{x}\right)=\frac{5xsec^{2}\left(x\right)−5tan\left(x\right)}{x^{2}}.$

1.12. $ \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}\left(x^{2}+1\right)^{2}}.$.

1.13. $ \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. $ \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}\left(3+x\right)}{e^{2x}}.$

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

1.16. $ \frac{d}{dx}\left(\frac{tan\left(x\right)}{ln\left(x\right)}\right)=\frac{xsec^{2}\left(x\right)ln\left(x\right)−tan\left(x\right)}{x\left(ln\left(x\right)\right)^{2}}.$

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

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

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