Answers: Solving exponential equations

Zoë Gemmell, Isabella Lewis, Akshat Srivastava

Summary

Answers to questions relating to solving exponential equations.

*These are the answers to* [*Questions: Solving exponential equations*](../questions/qs-solvingeqsindices.qmd)

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

Throughout this answer sheet, the natural logarithm $log\_{e}\left(x\right)$ is written as $ln\left(x\right)$.

1. The solution to $\sqrt[4]{x−4}=5$ is $x=629$.
2. The solution to $x^{4}=2^{8}$ is $x=4$.
3. The solution to $11^{x}=121^{x−1}$ is $x=2$.
4. The solution to $x^{0.5}$ is $x=529$.
5. The solution to $8^{2−x}=2^{4+3x}$ is $x=\frac{1}{3}$.
6. The solution to $2^{3x}=10$ is $x=\frac{log\_{2}\left(10\right)}{3}$.
7. The solution to $5^{3−x}=625$ is $x=−1$.
8. The solution to $16^{2x}=4^{x−1}$ is $x=−\frac{1}{3}$.
9. The solution to $7^{2−x}=4^{2x+3}$ is $x=log\_{112}\left(\frac{49}{64}\right)$.
10. The solution to $16=8^{3−7x}$ is $x=\frac{5}{21}$.
11. The solution to $e^{3−8x}−9=0$ is $x=\frac{3−ln\left(9\right)}{8}$.
12. The solution to $e^{4−3x}+8=12$ is $x=\frac{4−ln\left(4\right)}{3}$.
13. The solution to $\sqrt[3]{2^{4x}−4}=5$ is $x=\frac{log\_{2}\left(129\right)}{4}$.
14. The solution to $\sqrt[3]{e^{2x}−13}=81^{\frac{1}{4}}$ is $x=\frac{ln\left(40\right)}{2}$.
15. The solution to $\frac{5xa^{−7}b^{9}}{9a^{2}b^{−10}}=\frac{25b^{19}}{3a^{9}}$ is $x=15$.
16. The solution to $4^{x}⋅2^{x}=64$ is $x=2$.
17. The solution to $\frac{5^{x+1}⋅6^{x+1}}{3^{x+1}}=100$ is $x=1$.
18. The solution to $ \frac{\left[\left(\frac{1}{2}\right)^{x}⋅\left(\frac{−1}{4}\right)^{x}\right]}{\left(\frac{2}{3}\right)^{x}}=−\frac{27}{4096}$ is $x=3$.
19. The solution to $3^{x+1}=7^{x}$ is $x=log\_{7/3}\left(3\right)$.
20. The solution to $5^{x+1}+5^{x}=12$ is $x=log\_{5}\left(2\right)$.
21. The solution to $2^{3x−1}=10^{x}$ is $x=log\_{4/5}\left(2\right)$.
22. The solution to $2^{2x}−2^{x+3}−2^{4}=0$ is $x=log\_{2}\left(4+4\sqrt{2}\right)$.

## Version history and licensing

v1.0: initial version created 08/23 by Zoë Gemmell, Isabella Lewis, Akshat Srivastava as part of a University of St Andrews STEP project.

* v1.1: edited 05/24 by tdhc.

[This work is licensed under CC BY-NC-SA 4.0.](https://creativecommons.org/licenses/by-nc-sa/4.0/?ref=chooser-v1)