

# Answers: Solving exponential equations

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## Summary

Answers to questions relating to solving exponential equations.

*These are the answers to [Questions: Solving exponential equations](#)*

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

Throughout this answer sheet, the natural logarithm  $\log_e(x)$  is written as  $\ln(x)$ .

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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  $x = \frac{\log_2(10)}{3}$ .
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  $x = \frac{3 - \ln(9)}{8}$ .

12. The solution to  $e^{4-3x} + 8 = 12$  is  $x = \frac{4-\ln(4)}{3}$ .
13. The solution to  $\sqrt[3]{2^{4x}-4} = 5$  is  $x = \frac{\log_2(129)}{4}$ .
14. The solution to  $\sqrt[3]{e^{2x}-13} = 81^{\frac{1}{4}}$  is  $x = \frac{\ln(40)}{2}$ .
15. The solution to  $\frac{5xa^{-7}b^9}{9a^2b^{-10}} = \frac{25b^{19}}{3a^9}$  is  $x = 15$ .
16. The solution to  $4^x \cdot 2^x = 64$  is  $x = 2$ .
17. The solution to  $\frac{5^{x+1} \cdot 6^{x+1}}{3^{x+1}} = 100$  is  $x = 1$ .
18. The solution to  $\frac{\left[\left(\frac{1}{2}\right)^x \cdot \left(\frac{-1}{4}\right)^x\right]}{\left(\frac{2}{3}\right)^x} = -\frac{27}{4096}$  is  $x = 3$ .
19. The solution to  $3^{x+1} = 7^x$  is  $x = \log_{7/3}(3)$ .
20. The solution to  $5^{x+1} + 5^x = 12$  is  $x = \log_5(2)$ .
21. The solution to  $2^{3x-1} = 10^x$  is  $x = \log_{4/5}(2)$ .
22. The solution to  $2^{2x} - 2^{x+3} - 2^4 = 0$  is  $x = \log_2(4 + 4\sqrt{2})$ .

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## 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.

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