

Solve the following equations for all values of x .

6. $5^{x+3} = 19^x$

7. $\ln 2^{4x-1} = \ln 8^{x+5} + \log_2 16^{1-2x}$

8. $\log_x 4 - \log_2 x = 1$

9. $(1 + \sqrt{2})^x + (1 - \sqrt{2})^x = 6$

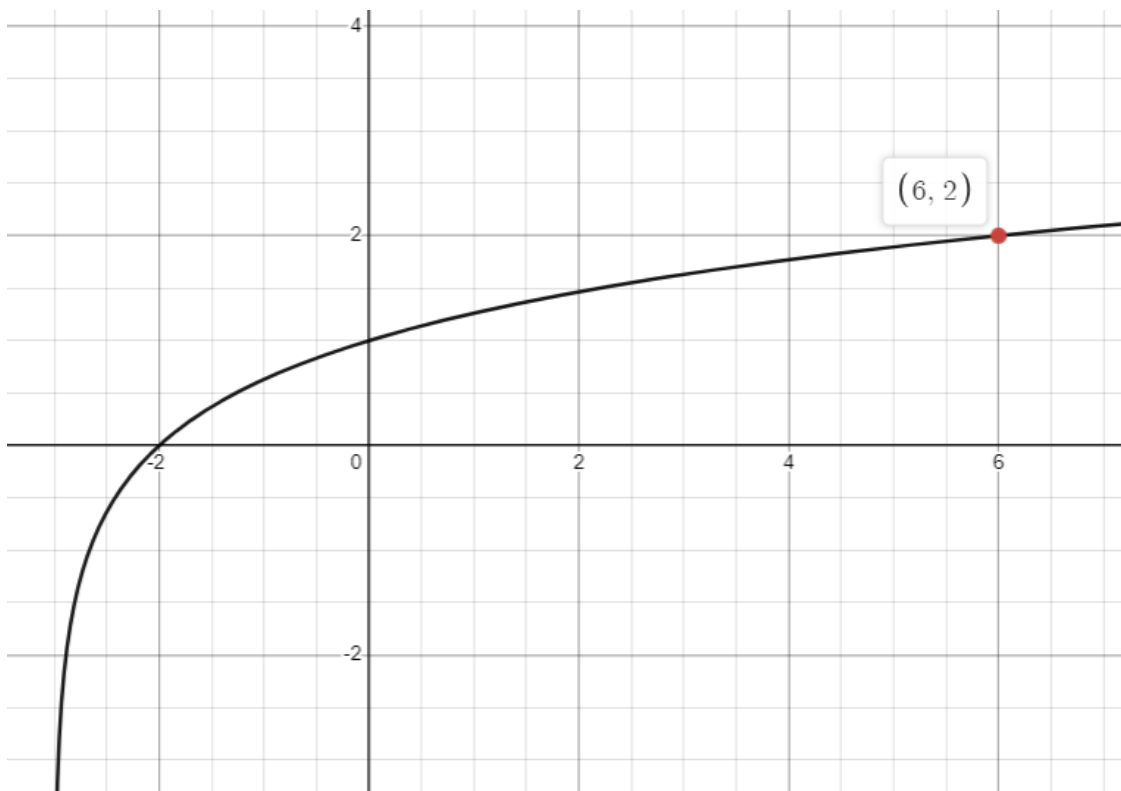
10. Solve the system of equations:

(1) $\log_{x+1} y = 2$

(2) $\log_{y+1} x = \frac{1}{4}$

11. Radium-226 has a half-life of 1599 years. There is initially an amount of 7 grams present in a substance. How long will it take for it to decay to 2 grams?

12. Let $f(x) = \log_p(x + 3)$ for $x > -3$. Part of the graph of f is shown below.



The graph passes through the point $(6, 2)$, has an x-intercept at $(-2, 0)$ and has an asymptote at $x = -3$.
Find p .

13. A city is concerned about pollution, and decides to look at the number of people using taxis. At the end of the year 2000, there were 280 taxis in the city. After n years the number of taxis, T , in the city is given by $T = 280 \times 1.12^n$

At the end of 2000, there were 25600 people in the city who used taxis is given by:

$$P = \frac{2560000}{10 + 90e^{-0.1n}}$$

- a. Find the value of P at the end of 2005, giving your answer to the nearest whole number.

- b. After seven complete years, will the value of P double its value compared to the end of 2000? Justify your answer.

- c. Let R be the ratio of the number of people using taxis in the city to the number of taxis. The city will reduce the number of taxis if $R < 70$. Find the value of R at the end of 2000.

- d. After how many complete years will the city first reduce the number of taxis?