EXPONENTIAL & LOGARITHMIC EQUATIONS

Solve each equation. Give an exact solution.

1. $\log_{49} x = -\frac{1}{2}$

2. $3^{4x+1} - 5 = 22$

3. $\log_5 (x+1) - \log_5 x = 2$

4. $8^{x+2} = 16$

5. $\log_4 (3x-2) = 2$

6. $\log (2x-1) + \log x = 1$

Solve each equation. Give an exact solution and a four-decimal place approximation.

7. $5^{2x} = 12$

8. $\ln(x+3) = 2$

9. $4^{x-2} = 3$

10. $2^{x-3} = 6^{1-2x}$

11. The population of Italy has been decreasing at a rate of 0.1% per year. There were 56,783,000 people living in Italy in 1998. Use the exponential decay model $y = y_0 e^{-0.001t}$ to answer the following.

a) How many inhabitants will there be by 2005, round your answer to the nearest whole number.

b) How long, to the nearest tenth, will it take for there to be 50,000,000? Answer to one decimal place.

c) How long, to the nearest tenth, will it take for the population to decrease by one half? Answer to one decimal place.

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Answers

1. $\frac{1}{7}$ 2. $\frac{1}{2}$ 3. $\frac{1}{24}$ 4. $-\frac{2}{3}$ 5. 6 6. $\frac{5}{2}$

7. Exact $x = \frac{1}{2}\log_5 12$ Approx. 0.7720 8. Exact $e^2 - 3$ Approx. 4.3891

9. Exact $x = \frac{\ln 3}{\ln 4} + 2$ Approx. 2.7925 10. Exact $x = \frac{\ln 48}{\ln 72}$ Approx. 0.9052

11. a) 56,386,907 b) 127.2 years c) 693.1 years