

Solving Exponential and Logarithmic Equations

Date _____

CLASS EXAMPLES - EXPONENTIAL EQUATIONS: Solve each equation.

1) $5^{3a} = 5^{2a+2}$

2) $32^{2x} = 2^4$

EXPONENTIAL EQUATIONS: Solve each equation.

3) $625^{x+1} = 25^x$

4) $36^{3m} = 216^{-m}$

5) $3^{-3n-2} = 3^{3n-1}$

6) $64^{3x} = 16$

CLASS EXAMPLES: Solve each equation. Round your answers to the nearest ten-thousandth.

7) $10^a + 10 = 46$

8) $e^a = 26$

9) $10^{7x} = 12$

10) $8 \cdot 5^{k+10} = 70.9$

Solve each equation. Round your answers to the nearest ten-thousandth.

11) $4^x = 72$

12) $2^{m-2} = 62$

13) $11^p + 10 = 62$

14) $13^{-10r} + 2 = 48$

CLASS EXAMPLES: Solve each equation. (LOGS ON BOTH SIDES)

15) $\log_4 (b^2 + 11) = \log_4 (-10b + 2)$

16) $\log_5 9 + \log_5 3x = \log_5 54$

17) $\log_6 9 - \log_6 (x - 2) = \log_6 49$

18) $\log (x^2 + 9) + \log 2 = \log 36$

Solve each equation.

19) $\log (5x - 7) = \log 3$

20) $\log_{16} (3 - 5p) = \log_{16} (3 - 2p)$

21) $\log_{16} (n^2 + 83) = \log_{16} (18n + 3)$

22) $\log (3 + k^2) = \log (2k^2 + 2k)$

$$23) \ln 7 - \ln -3x = \ln 53$$

$$24) \log_6 (x + 2) - \log_6 x = \log_6 22$$

CLASS EXAMPLES: Solve each equation. (LOGS ON ONE SIDE)

$$25) \log_4 n = 0$$

$$26) \log_9 (m - 2) = 4$$

$$27) 1 + \log_8 5r = 5$$

$$28) \log_2 9 + \log_2 4x^2 = 4$$

Solve each equation.

$$29) \log_8 n = 2$$

$$30) \log_9 (n + 7) = 4$$

$$31) \log_2 9r = 3$$

$$32) 2\log_8 x = -2$$

$$33) 10\log_5 x = 0$$

$$34) 2\log 10n = 6$$

$$35) \log_3 (x + 6) - \log_3 x = 5$$

$$36) \log_7 2x + \log_7 8 = 1$$

37) $\log_5 (x^2 - 10) + \log_5 9 = 1$

38) $\log_7 4x^2 + \log_7 4 = 4$

39) Sophie is buying a used car for \$4,500.00. The car is depreciating at a rate of 5% each month.

- a) Write an equation which models the value of the car after "x" months.
- b) How much will the car be worth after 8 months?
- c) When will the car's value be \$2,000?

40) William has a goat farm with 6 goats. It is predicted that the goat population will grow at a rate of 20% each year.

- a) Write an equation which will model the number of goats he has after "x" years.
- b) How many goats will William have after 10 years?
- c) How long will it take William to end up with a herd of 20 goats?

41) Mr. Allen-Black deposited \$3,200 into a savings account, which pays him 3.5% APR.

- a) How much will Mr. Allen-Black have accrued in the account after 5 years if the interest is compounded quarterly?
- b) How much less (or more?) would Mr. Allen-Black have accrued in 5 years if the interest were compounded continuously?
- c) How many years would it take Mr. A-B to accrue \$10,000 considering the interest is compounded quarterly?
- d) How many years would it take Mr. A-B to accrue \$10,000 if the interest was compounded continuously?

Answers to Solving Exponential and Logarithmic Equations (ID: 1)

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|--|--|-------------------------------------|--|
| 1) $\{2\}$ | 2) $\left\{\frac{2}{5}\right\}$ | 3) $\{-2\}$ | 4) $\{0\}$ |
| 5) $\left\{-\frac{1}{6}\right\}$ | 6) $\left\{\frac{2}{9}\right\}$ | 7) 1.5563 | 8) 3.2581 |
| 9) 0.1542 | 10) -8.6444 | 11) 3.085 | 12) 7.9542 |
| 13) 1.6478 | 14) -0.1493 | 15) $\{-9, -1\}$ | 16) $\{2\}$ |
| 17) $\left\{\frac{107}{49}\right\}$ | 18) $\{3, -3\}$ | 19) $\{2\}$ | 20) $\{0\}$ |
| 21) $\{8, 10\}$ | 22) $\{1, -3\}$ | 23) $\left\{-\frac{7}{159}\right\}$ | 24) $\left\{\frac{2}{21}\right\}$ |
| 25) $\{1\}$ | 26) $\{6563\}$ | 27) $\left\{\frac{4096}{5}\right\}$ | 28) $\left\{\frac{2}{3}, -\frac{2}{3}\right\}$ |
| 29) $\{64\}$ | 30) $\{6554\}$ | 31) $\left\{\frac{8}{9}\right\}$ | 32) $\left\{\frac{1}{8}\right\}$ |
| 33) $\{1\}$ | 34) $\{100\}$ | 35) $\left\{\frac{3}{121}\right\}$ | 36) $\left\{\frac{7}{16}\right\}$ |
| 37) $\left\{\frac{\sqrt{95}}{3}, -\frac{\sqrt{95}}{3}\right\}$ | 38) $\left\{\frac{49}{4}, -\frac{49}{4}\right\}$ | | |
| 39) a) $y = 4500 \cdot 0.95^x$ b) \$2,985.39 c) 15.81 months | | | |
| 40) a) $y = 6 \cdot 1.2^x$ b) 37.15 goats c) 6.604 Years | | | |
| 41) a) \$3809.09 b) \$2.90 more c) 32.70 yrs. d) 32.56 yrs. | | | |