Precalculus

Topic: Exponential and Logarithmic Equations

Instructions

Solve the following exponential and logarithmic equations. Show all work clearly and check your solutions.

Practice Problems

1. **Solve the following exponential equations:**

   (i) $2^x = 16$
   (ii) $3^{x+2} = 81$
   (iii) $5^{x-1} = 25$
   (iv) $e^{2x} = 20$
   (v) $10^{x+3} = 1000$
   (vi) $4^x = 64$
   (vii) $2^{x-1} = 32$
   (viii) $5^{3x} = 125$

2. **Solve the logarithmic equation for x:**

   (i) $\log_2 x = 5$
   (ii) $\log_3(x-2) = 2$
   (iii) $\log_4 x = 3$
   (iv) $\ln(x+1) = 4$
   (v) $\log_5(x+3) = 2$
   (vi) $\log_2(x^2) = 6$
   (vii) $\log_3(x+1) = 3$
   (viii) $\log_7(x-1) = 1$
   (ix) $\log(x+1) + \log(x+2) = \log 20$
   (x) $\log_2 x + \log_2(x+3) = 1$
   (xi) $\log_5(x-5) + \log_5(x+3) = 1$
   (xii) $\ln(x+1) + \ln(x+2) = 1$
   (xiii) $\log_2(x+3) = \log_2(x+1) + \log_2 3$

3. **Solve the following combined exponential and logarithmic equations:**

(i) $2^{x+1} = \log_2(x+7)$
(ii) $3^x = \log_3(x+5)$
(iii) $e^{2x} = \ln(x+2)$
(iv) $10^x = \log_1 0(x^2+3)$
(v) $4^{x+2} = \log_4(x+4)$
(vi) $5^{x-3} = \log_5(x^2-3)$
(vii) $2^{x+1} = \log_2(x+3)$
(viii) $e^x = \ln(x^2+1)$

4. **Use the change of base formula to simplify the following logarithmic expressions:**

(i) $\log_2 16$
(ii) $\log_5 125$
(iii) $\log_3 81$
(iv) $\log_7 49$
(v) $\log_4 64$
(vi) $\log_2 8$
(vii) $\log_6 36$
(viii) $\log_1 01000$

Multiple-Choice Questions

1. What is the solution to $3^x = 81$?

A. 4
B. 2
C. 3
D. 5

2. Which of the following is the solution to $\log_2(x+3) = 4$?

A. $x = 16$
B. $x = 13$
C. $x = 1$
D. $x = 7$

3. What is the solution to $2^x = 32$?

A. 5
B. 4
C. 3
D. 2

4. Which of the following is the value of $\log_5 25$?

A. 2
B. 3
C. 1
D. 5

5. What is the value of $\log_2 32$?

A. 4
B. 5
C. 6
D. 3