**4.5: (Exponential and Logarithmic Equations)**

The solution set of the equation $9^x - 2(3)^{x+1} = 27$ consists of

A) one positive real number only

B) two negative real numbers

C) one negative real number only

D) one positive and one negative real number

E) two positive real numbers

The sum of all the solution(s) of the equation $2(4^{1-x}) - 3(2^{1-x}) = -1$ is

A) $\log_2 6$

B) 3

C) -3

D) 1

E) $\log_2 3$

The sum of all solutions of the equation $(8)^{x} = (\sqrt{2})^{2x+4}$ is

A) -1

B) 3

C) -2

D) 1

E) 2

If $(\sqrt[4]{3})^{8x+12} = (e)^{3x\ln 3}$, then $x =$

A) 3

B) 4

C) - 2

D) $\frac{3}{2}$

E) $\frac{5}{2}$

If $\frac{8^x+8^{-x}}{8^x-8^{-x}} = 3$, then $x =$

A) $\frac{1}{6}$

B) $\ln\ 6$

C) $\ln\ 2$

D) 1

E) – 1

If the solution of the equation $2^{3x-2} = 5^{x+1}$ is $x = \frac{\ln\ a+\ln\ b}{\ln\ c-\ln\ b}$, then $a + b + c =$

A) 17

B) 13

C) 11

D) 15

E) 19

The sum of solutions of the equation $2^x - (6)2^{(-x)} - 1 = 0$ is

A) -1

B) $\log_3 (2)$

C) $\ln\ 3$

D) $\log_2 (3)$

E) $\ln\ \sqrt{3}$

The sum of all the solutions of the equation $2 \cdot 3^x - 21 \cdot 3^{-x} + 1 = 0$ is

A) 1

B) 3

C) $-\frac{1}{2}$

D) $\frac{9}{2}$

E) $\frac{1}{2}$

The sum of all solution(s) of the equation $e^x - 12e^{-x} - 1 = 0$, is

A) $\ln\ 4$

B) $\ln\ 12$

C) $\ln\ 3$

D) $1 + \ln\ 2$

E) $-\ln\ 12$

If $6^{x+1} = 4^{2x-1}$ then, $x =$

A) $\frac{\log\ 24}{\log\ (8/3)}$

B) $\frac{\log\ 24}{\log\ (3/8)}$

C) $\frac{\log\ (3/2)}{\log\ (8/3)}$

D) $\frac{\log\ 8}{\log\ (1/2)}$

E) $\frac{\log\ 8}{\log\ (3/8)}$

If $\log\ 2 = t$, then solving the equation $2^{x+3} = 5^x$ in terms of $t$, we get $x =$

A) $\frac{3t}{1-2t}$

B) $\frac{2t}{1-3t}$

C) $\frac{1-3t}{2t}$

D) $\frac{3t}{1+2t}$

E) $\frac{1+2t}{3t}$

If $5^x = (3)(4^{1-x})$, then $x =$

A) $\frac{\ln\ 12}{\ln\ 20}$

B) $\ln\left(\frac{3}{5}\right)$

C) $\frac{\ln\ 3}{\ln\ 5}$

D) $\frac{\ln\ 6}{\ln\ 10}$

E) $\frac{\ln\ 5}{\ln\ 3}$

If the solution of the equation $2^{2x+1} = 7(2^x) + 4$ is $x = A$, then $2A - 1 =$

A) $\frac{1}{2}$

B) 3

C) $\frac{3}{2}$

D) 0

E) 4

The solution set of the equation $4^x - 2^x - 12 = 0$ consists of

A) one positive integer only.

B) one positive integer and one negative integer.

C) two positive integers.

D) two negative integers.

E) one negative integer only.

The sum of all the solution(s) of the equation $4^x - 2^{x+3} + 12 = 0$ is

A) $\log_2 12$

B) $\log_2 6$

C) 7

D) $\log_2 8$

E) 1

If $2^{x+1} = 3^{2x-1}$, then $x =$

(A) $\log_{9/2} 6$

B) $\log_{9/2} 5$

C) $\log_{3/2} 6$

D) $\log 6$

E) $\log_6 5$

The sum of solutions of the equation $2e^{2x} - 13e^{x} = 15$ is:

A) $\ln \frac{15}{2}$

B) $\ln \frac{17}{2}$

C) $\ln \frac{13}{2}$

D) $\ln \frac{3}{10}$

E) $\ln \frac{7}{2}$

If $6e^{x} - 15e^{-x} + 1 = 0$, then $e^{2x} =$

A) $\frac{25}{9}$

B) $\frac{1}{4}$

C) $\frac{9}{4}$

D) $\frac{25}{4}$

E) $\frac{9}{25}$

The equation $9^x - 2(3^{x+1}) = 27$

A) has only one positive integer solution.

B) has two real solutions.

C) has only one negative integer solution.

D) has two nonreal solutions.

E) has no solution.

The sum of all solutions of the equation $2e^x + 6e^{-x} = 7$ is

A) $\ln 3$

B) $\ln 2$

C) $\ln \frac{2}{3}$

D) $\ln \frac{3}{2}$

E) $\ln \frac{7}{2}$

If the line $y = \frac{26}{27}$ intersects the graph of $y = -3^{x-2} + 1$ at the point $(x_1, y_1)$, then $x_1 + y_1 =$

A) $\frac{28}{27}$

B) $-\frac{5}{27}$

C) $-\frac{23}{27}$

D) $-\frac{7}{27}$

E) $-\frac{1}{27}$

The solution set of $(\sqrt{2})^{12x-8} = 4\left(\frac{1}{2}\right)^{5x+7}$

A) contains exactly one negative rational number

B) contains exactly one negative irrational number

C) contains exactly one positive irrational number

D) contains exactly one positive rational number

E) is the empty set

f $y = \mathrm{A} + \mathrm{B}(1 - e^{-cx})$, then $x =$

A) $-\frac{1}{c}\ln\left(\frac{\mathrm{B}-y+\mathrm{A}}{\mathrm{B}}\right)$

B) $-\frac{1}{c}\ln\left(\frac{\mathrm{B}+y+\mathrm{A}}{\mathrm{B}}\right)$

C) $-\frac{1}{c}\ln\left(\frac{\mathrm{B}-y-\mathrm{A}}{\mathrm{B}}\right)$

D) $-\frac{1}{c}\ln\left(\frac{\mathrm{B}-y+\mathrm{A}}{\mathrm{A}}\right)$

E) $-\frac{1}{c}\ln\left(\frac{\mathrm{B}+y-\mathrm{A}}{\mathrm{A}}\right)$

If the solution of the equation $\frac{7^x+7^{-x}}{7^x-7^{-x}} = 2$ is $x = \log_b \sqrt{a}$ then $a \cdot b =$

A) 21

B) 34

C) 14

D) 9

E) 24

The sum of all solution(s) of the equation $e^x - 12e^{-x} - 1 = 0$, is

A) $\ln\ 4$

B) $\ln\ 12$

C) $\ln\ 3$

D) $1 + \ln\ 2$

E) $-\ln\ 12$

The SUM of all solutions of the equation $125^{-3} = \left(\frac{1}{5}\right)^{|x+2|}$ is

A) - 4

B) 1

C) 5

D) - 5

E) 4

If $x = a$ is the solution of the equation $125^x + 5^{3x+1} = 12$, then $3a =$

A) 3

B) $\log_5 2$

C) $\log_5 3$

D) 0

E) 2

If $e^{k-1} = \left(\frac{1}{e^4}\right)^{k+1}$, then $k =$

A) $-3/5$

B) $1/5$

C) $1/2$

D) -2

E) $1/3$

The sum of all the solution(s) of $2(3^{2x-6}) - 4 = 8$ is

A) $3 + \log_3 \sqrt{6}$

B) $6 + \log_3 6$

C) $3 + \log_3 36$

D) $6 - \log_3 \sqrt{6}$

E) $6 - \log_3 \sqrt{3}$

The sum of all the solution(s) of $e^x - 6e^{-x} = -1$ is

A) $\ln 2$

B) $\ln 3$

C) $-\ln 6$

D) 1

E) 2

The solution set of the equation $\log_3 (x-2) = 1 + \log_{\frac{1}{3}} (x+2)$ consists of

A) Two rational solutions.

B) Two solutions one rational and one irrational.

C) One irrational solution only.

D) Two irrational solutions of different signs.

E) Only one integer.

The solution set of the equation $\ln (4x-2) - \ln e^{\ln 4} = -\ln (x-2)$ contains

A) only one positive rational number

B) only one negative rational number

C) one negative and one positive rational numbers

D) two positive rational numbers

E) no real solution

The equation $\ln\ e^{\ln\ x^2} - \ln\ (4 - x) = \ln\ 2$ has

A) one negative and one positive real solution

B) only one positive real solution

C) only one negative real solution

D) two negative real solutions

E) no real solution

The sum of all the solution(s) of the equation $\ln\ (2x^2 - 4x + 1) = 2\ln\ (1 - x)$ is

A) 1

B) 2

C) -1

D) 0

E) -2

The solution set of the equation $\sqrt{\log_2 x} = -\log_2 \sqrt{x}$ contains

A) one positive integer only

B) one positive and one negative integers

C) no real numbers

D) two positive integers

E) one negative integer only

If $y = \log (x + 1) - \log x$, then $x =$

A) $\frac{1}{10^y - 1}$

B) $\frac{1}{10^y + 1}$

C) $10^y + 1$

D) $10^y - 1$

E) $\frac{1}{e^y - 1}$

The sum of all the solution(s) of $\log(x+2) = 1 + \log_{0.1}(x-1)$ is

A) -1

B) 1

C) 0

D) -3

E) 3

The sum of solutions of the equation $\log_2(x-1) = 2 - \log_2(x+1)$ is

A) 0

B) 5

C) $\sqrt{5}$

D) $-\sqrt{5}$

E) -5

If $x = k$ is the solution of $\log_3 (\log_4 (x - 36)) = 1$, then $\log\ k =$

A) 6

B) -1

C) 3

D) 2

E) 1

The solution set of the equation $\log_4 (x + 2) - 2\log_{\frac{1}{16}} (x - 1) = 1$ consists of

A) one positive integer only

B) one negative integer only

C) one positive irrational number only

D) two integers whose sum is - 1

E) one negative irrational number only

If the graph of the function $f(x) = \log_5 (x - 20)$ intersects the graph of the function $g(x) = \log_5 \left(\frac{1}{x}\right) + 3$ at the point $(a, b)$, then $a + b =$

A) 26

B) 25

C) 28

D) 21

E) 29

The sum of all the solutions of the equation $\frac{1}{2}\ln (3x + 8) = \frac{1}{2}\ln (2x + 2) + \frac{1}{4}\log_{\sqrt{e}} (x - 2)$ is

A) 4

B) $\frac{5}{2}$

C) 3

D) $\frac{1}{2}$

E) 5

The sum of all solutions of the equation $[\log_2 (x+3)]^2 = 4\log_2 (x+3)$ is

A) 11

B) 6

C) 13

D) 5

E) 4

The product of the solution(s) of the equation $\log_7 (x-1) - \log_{1/7} (x+1) = 2\log_{\sqrt{7}} 1 + \log_7 (2x-1)$ is

A) 2

B) 0

C) 3

D) 4

E) 6

The sum of all solution(s) of the equation $\log_2 \sqrt[3]{x+5} + \log_8 (3x-1) = 2$ is

A) 3

B) 14

C) 11

D) 10

E) -6

The sum of all solution(s) of the equation $\log_2 \sqrt{x-2} + \log_4 (x-4) = \frac{1}{2}[3 + \log_2 (3)]$ is:

A) 8

B) 6

C) 11

D) 10

E) -6

The sum of all the solution(s) of the equation $\log_{(x^2+2x)} 27 = 3$ is

A) -2

B) -4

C) -3

D) 4

E) 1

The sum of all the solution(s) of the equation $\log(5x) - \log_{0.1}(x-1) = 2$, is

A) 5

B) -4

C) 4

D) 1

E) 9

If $(\log_4 5)(\log_{25} 2x) = 1$, then $x = ?$

A) 8

B) 6

C) 4

D) 2

E) 10

The sum of all the solution(s) of the equation $\log_{\sqrt{5}}(x) + \log_5(x^2 - 3) + \log_{1/5} 4 = 0$ is

A) 2

B) 4

C) 0

D) 3

E) 6

If $\log_3(1) = -3 + \left(\frac{1}{3}\right)^{x+2}$, then $3x + 1 =$

A) -8

B) - 2

C) 0

D) 3

E) 10

If $\log_2 y = x$, then $\left(\frac{1}{8}\right)^{1-x} =$

A) $\frac{y^3}{8}$

B) $\frac{y^3}{2}$

C) $\frac{y}{8}$

D) $8y$

E) $8y^3$

The sum of all solution(s) of the equation $(\sqrt[3]{4})^{-|x-1|} = \left(\frac{1}{8}\right)^2$ is

A) 2

B) 8

C) 10

D) 18

E) 4

The sum of all the solution(s) of the equation $\log_{4x}(16) + \log_{\frac{x}{2}}(16) = 2$ is

A) $\frac{33}{2}$

B) $\frac{9}{2}$

C) $\frac{31}{2}$

D) $16$

E) $15$

The equation $\log_9 (5 - x) + \log_3 \sqrt{6 - x} = \frac{1}{\log_{12} (9)}$ has

A) only one positive real solution

B) only one negative real solution

C) two positive real solutions

D) two negative real solutions

E) no real solution