

Practice session 3

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Name: _____

1 Exponential and logarithmic equations

For this practice session we are going to solve several logarithmic and exponential equations. Use the theory from the last two practice session and the following properties if you need help.

Algebra properties

$$a + b = b + a, \quad (a + b) + c = a + (b + c), \quad a(b + c) = ab + ac,$$

$$\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}, \quad \frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}, \quad \frac{-a}{b} = -\frac{a}{b} = \frac{a}{-b}, \quad \frac{\frac{a}{b}}{\frac{c}{d}} = \frac{ad}{bc}$$

$$\sqrt{ab} = \sqrt{a}\sqrt{b}, \quad \sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}, \quad \sqrt[n]{a} = a^{1/n}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}, \quad a^2 - b^2 = (a - b)(a + b)$$

Laws of exponents

$$a^r \cdot a^s = a^{r+s}, \quad (a^r)^s = a^{rs}$$

$$\frac{a^r}{a^s} = a^{r-s}, \quad (ab)^r = a^r b^r$$

$$\left(\frac{a}{b}\right)^r = \frac{a^r}{b^r}, \quad b \neq 0$$

Laws of Logarithms

$$\log_a(AB) = \log_a(A) + \log_a(B)$$

$$\log_a\left(\frac{A}{B}\right) = \log_a(A) - \log_a(B)$$

$$\log_a(A^C) = C \log_a(A)$$

Inverse functions property

$$(f \circ f^{-1})(x) = x = (f^{-1} \circ f)(x) \quad \rightarrow \quad \log_a(a^x) = x = a^{\log_a(x)}$$

2 Excercises

From the following equations, solve for x ,

$$1. \quad e^{3x-2} = e^{x^2}$$

$$2. \quad 3 \log(x) = 6 - 2x$$

$$3. \quad \log_3(x - 8) + \log_3(x) = 2$$

$$4. \quad \log_2(x + a) + \log_2(x - b) = c$$

$$5. \quad 5^{x/10} + 1 = 7$$

$$6. \quad 4 - x^2 = e^{-2x}$$

$$7. \quad \ln(x - 2) + \ln(3) = \ln(5x - 7)$$

$$8. \quad \left(1 - e^{t/\alpha}\right)^x = \frac{a}{b}$$