Solving Equations with Logs and Exponents

Names _____

Solve each of the following, taking turns on the problems. Show work. Round your answers to 3 decimal places, when necessary. Use the following guidelines to help you:

- If the equation is in log form, try changing it to exponential form.
- If the equation is in exponential form, try rewriting in log form. Remember to get the "b^x" term by itself first.
- Don't forget to expand or condense when appropriate, using these properties:
  - $\log (ab) = \log a + \log b$
  - $\log (a/b) = \log a - \log b$
  - $\log a^b = b \log a$
  - $\log_b a = \dfrac{\log a}{\log b}$

Calculator OK!

1) $18^{3x-5} = 56$

$\log_{18} 56 = 3x-5$

$\dfrac{\log 56}{\log 18} = 3x-5$

$x \approx 2.131$

2) $\ln x = 4$

$e^4 = x$

$x \approx 54.598$

3) $4 - 2e^x = -23$

$-2e^x = -27$

$e^x = 13.5$

$\ln 13.5 = x$

$x \approx 2.603$

4) $\dfrac{2\log 2x}{2} = \dfrac{9}{2}$

$\log 2x = 4.5$

$10^{4.5} = 2x$

$x = \dfrac{10^{4.5}}{2}$

$x \approx 15,811.388$

5) $7\ln(2x) - 5 = 16$

$+5 \quad +5$

$7\ln(2x) = 21$

$\ln(2x) = 3$

$e^3 = 2x$

$x = \dfrac{e^3}{2}$

$x \approx 10.04$

6) $\frac{1}{2}(8)^{2x} + 2 = 9$

$-2 \quad -2$

$2 \cdot \frac{1}{2}(8)^{2x} = 7 \cdot 2$

$(8)^{2x} = 14$

$\log_8 14 = 2x$

$\dfrac{\log 14}{\log 8} = 2x$

$x \approx .635$

No Calculator!

7) $\log_x 18 = 2$

$x^2 = 18$

$x = \sqrt{18}$

$\boxed{x = 3\sqrt{2}}$

(log bases only positive)

8) $\ln e^{-5} = x$

$e^x = e^{-5}$

$\boxed{x = -5}$

9) $\log 6 + 2\log x = \log 216$

$\log 6 + \log x^2 = \log 216$

$\log 6x^2 = \log 216$

$6x^2 = 216$

$x^2 = 36$

$x = \pm 6$

$\boxed{x = 6}$ (-6 extraneous)

10) $2\log 3 + 4\log x = \log 144$

$\log 9 + \log x^4 = \log 144$

$\log 9x^4 = \log 144$

$9x^4 = 144$

$x^4 = 16$

$x = \pm 2$

$\boxed{x = 2}$ (-2 extraneous)

Answer Sheet **Names** _____

Directions: Answer each question, and follow the directions to create your picture. Turn in the picture for a classwork grade.

1. If $x<1$, draw 1 tree. If $x>1$, draw 2 trees.
2. Look at the tens digit of your answer. Draw that number of apples in a tree.
3. If $x<1$, draw the sun. If $x>1$, draw the moon.
4. If x starts with a 1, draw a star. If x doesn't start with 1, draw a rainbow.
5. If $x<12$, draw a bird. If $x>12$, draw a dog.
6. If $x<1$, draw a tire swing. If $x>1$, draw a rope swing.
7. If x is a whole number, draw a giraffe. If x is a radical, draw a hippo.
8. If x is positive, draw a hat on the animal you drew in #7. If x is negative, draw boots.
9. Draw x flowers.
10. Draw x turtles.