Name _____ Date _____ Period____

5.6 Solving Exponential Equations Notes

Warm up

Solve the exponential function.

$9^{x+2} = 27^{4x-2}$

$(3^2)^{x+2} = (3^3)^{4x-2}$

$2x+4 = 12x-6$

$10 = 10x$

$x = 1$

Rewrite the exponential equation into an equivalent log equation.

$9^x = 42$

$\log_9 42 = x$

Can put into calculator using $\log_{\square}\square$ key to estimate.

Solving Exponential Equations when you cannot use a common base.

1. Isolate the exponential expression.
2. Solve the equation. TAKE the Log of both sides.
3. You may need to expand the log by using the power rule.
4. Solve and check for extraneous solutions

Solving with common log.

1. $2^x = 61$

$\log 2^x = \log 61$

$x \cdot \frac{\log 2}{\log 2} = \frac{\log 61}{\log 2}$

$x = \frac{\log 61}{\log 2}$ exact answer

≈ 5.931 rounded

Check work using calculator

2. $8^{m-7} = 92$

$\log 8^{m-7} = \log 92$

$(m-7)\log 8 = \log 92$

$m-7 = \frac{\log 92}{\log 8}$

$m = \frac{\log 92}{\log 8} + 7$

≈ 9.175

Careful entering into calculator

3. $4 \cdot 7^x = 148$

$\frac{4}{4} \quad \frac{4}{4}$

$7^x = 37$

$\log 7^x = \log 37$

$x \log 7 = \log 37$

$x = \frac{\log 37}{\log 7}$

$x \approx 1.856$

4. $4^{3w} - 5 = 3$

$+5 \quad +5$

$4^{3w} = 8$ → Could be solved by common base.

$\log 4^{3w} = \log 8$

$3w \log 4 = \log 8$

$\frac{3w}{3} = \frac{\log 8}{\log 4} \cdot \frac{1}{3}$

$w = \frac{\log 8}{3 \log 4}$

$= 0.500$

5. $7 - 4^{x+1} = 18$

$-7 \quad -7$

$-4^{x+1} = 11$

$\frac{}{-1} \quad \frac{}{-1}$

$4^{x+1} = -11$

not possible

$\emptyset$

6. $4(3^x) + 15 = 359$

$-15 \quad -15$

$\frac{4 \cdot 3^x}{4} = \frac{344}{4}$

$3^x = 86$

$\log 3^x = \log 86$

$x \cdot \log 3 = \log 86$

$x = \frac{\log 86}{\log 3}$

$x \approx 4.055$