7.3 Solving Exponential Equations

Common Base

$4^{2x} = 8^{x+1}$

$(2^2)^{2x} = (2^3)^{x+1}$

$2^{4x} = 2^{3x+3}$

$4x = 3x + 3$

$-3x \quad -3x$

$x = 3$

Verify

$4^{2(3)} = 8^{3+1}$

$4^6 = 8^4$

$4096 = 4096$

Graphing/Table

$Y_1 = 4^{2x}$

$Y_2 = 8^{x+1}$

Intersect

$(3, 4096)$

TABLE

X	Y_1	Y_2
3	4096	4096

Logs

Ch. 8

Ex) Solve $9^{4x} = 27^{x-1}$ using 2 methods.

$$(3^2)^{4x} = (3^3)^{x-1}$$

$$3^{8x} = 3^{3x-3}$$

$$8x = 3x - 3$$

$$5x = -3$$

$$x = -3/5$$

Verify...

$Y_1 = 9^{4x}$

$Y_2 = 27^{x-1}$

$(-3/5, 0.005...)$

Ex) Write $81^{1/4} \times \sqrt[4]{27}^{\,5}$ as a single power of 3.

$(3^4)^{1/4} \times (3^3)^{5/4}$

$3^{4/4} \times 3^{15/4}$

$3^1 \times 3^{15/4}$

$3^{4/4+15/4} = 3^{19/4} \rightarrow 3^{16/4} \times 3^{3/4}$

$\sqrt[4]{3}^{\,19}$

$3^4 \times 3^{3/4}$

$81\sqrt[4]{3}^{\,3}$

Simplify as a radical.

$\sqrt[4]{3}^{\,19} = \sqrt[4]{3}^{\,16} \times \sqrt[4]{3}^{\,3}$

$= 81\sqrt[4]{3}^{\,3}$

Ex) We have \$5000 to invest, at 6.12% per year, compounded quarterly. How long until we have \$6000?

$$A = P(1+i)^n$$

n ← number of compounding periods

A: amount later

P: principle amount

i: interest rate (per compounding period)

(115%)

\$10 x 1.15

\$1.50

11.50

$$6000 = 5000\left(1+\frac{0.0612}{4}\right)^n$$

$$6000 = 5000(1+0.0153)^n$$

$$\frac{6000}{5000} = \frac{\cancel{5000}(1.0153)^n}{\cancel{5000}}$$

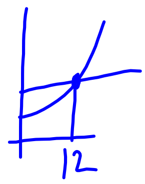
$$1.2 = 1.0153^n$$

Graph

$Y_1 = 6000$

$Y_2 = 5000(1.0153)^n$

X	Y_1	Y_2
	6000	
12	↓	6000



12 compounding periods (quarterly) → 3 years

$\boxed{\text{pg. 364-365 \#1-5, 7, 9-14, 16, C1, C2}}$