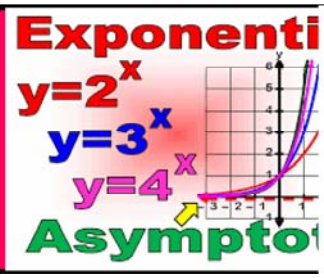
Unit 4

Exponents and Logarithms



4.2 Solving Exponential Equations

There are three ways to solve exponential equations:

- make like bases, and solve algebraically
- graphically
- logarithms

In order to solve exponential equations with like bases, we need to be able to recognize some common exponents.

Ex.) Convert the following to a like base of '2'.

a) 4 b) 8 c) 16 d) 32 e) 1

2^2 2^3 2^4 2^5 2^0

Ex.) Convert the following to a like base of '5'.

a) 1 b) 25 c) 125 d) 1/5 e) 1/25

5^0 5^2 5^3 $\frac{1}{5}$ $= 5^{-2}$

$= 5^{-1}$

Steps for solving exponential equations:

* Isolate.

1. Look for like bases. If they are not immediate, see if you can create like bases.
2. Drop the bases and solve the exponents using algebra.

Ex.) Solve.

a) $3^x = 27$

$3^x = 3^3$

$x = 3$

b) $10^{2x} = 100$

$10^{2x} = 10^2$

$\frac{2x}{2} = \frac{2}{2}$

$x = 1$

c) $2^{x+1} = 8$

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

$x + 1 = 3$

$-1 \quad -1$

$x = 2$

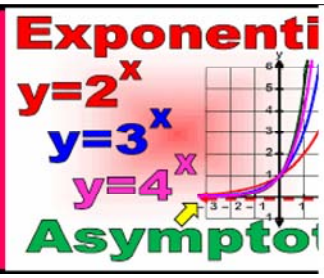
d) $4^x - 2 = 14$

$+2 \quad +2$

$4^x = 16$

$4^x = 4^2$

$x = 2$



Ex.) Solve.

* Brackets!!!

a) $4^{x+2} = 64^{x}$

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

$x+2 = 3x$

$-x \quad -1x$

$\frac{2}{2} = \frac{2x}{2}$

$1 = x$

b) $4^{2x} = 8^{2x-3}$

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

$2(2x) = 3(2x-3)$

$4x = 6x - 9$

$-6x \quad -6x$

$\frac{-2x}{-2} = \frac{-9}{-2}$

$x = \frac{9}{2}$

c) $3^{x}+1 = 10$

$-1 \quad -1$

$3^{x} = 9$

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

$x = 2$

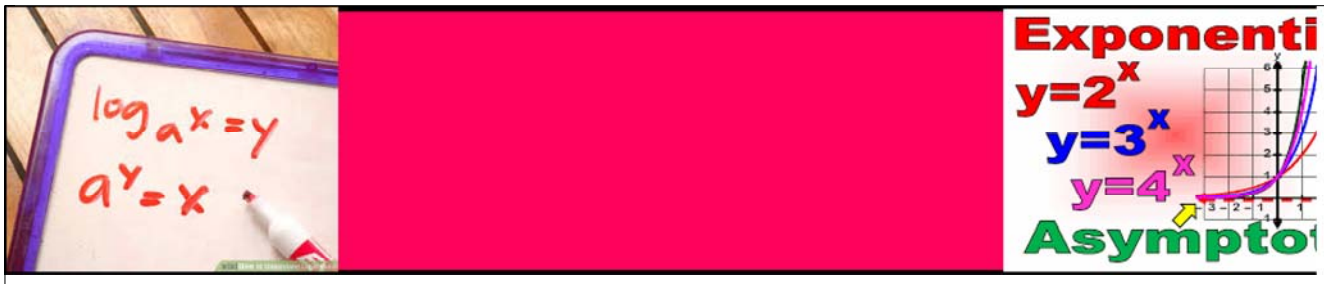
d) $4^{x-3} = 1024$

$4^{x-3} = 4^{5}$

$x - 3 = 5$

$+3 \quad +3$

$x = 8$



Ex.) Solve.

a) $8^{3x-2} = 16^{x+1}$

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

$3(3x-2) = 4(x+1)$

$9x-6 = 4x+4$

$-4x \quad -4x$

$5x-6 = 4$

$+6 \quad +6$

$\frac{5x}{5} = \frac{10}{5}$

$x = 2$

b) $27^{x+3} = (1/9)^{2x-5}$

$3^{3(x+3)} = 3^{-2(2x-5)}$

$3(x+3) = -2(2x-5)$

$3x+9 = -4x+10$

$+4x \quad +4x$

$7x+9 = 10$

$-9 \quad -9$

$\frac{7x}{7} = \frac{1}{7}$

$x = 1/7$

When solving graphically, graph $y_1=$, $y_2=$ and find t[redacted] the[redacted]
The window may need to change.

Ex.) $3^x = 27$

y_1 y_2

$X = 3$

Ex.) $5^{x+2} = 7^{2x-1}$

$y_1=$ $y_2=$

$X \approx 2.3$

approx

Pg. 361 #2, 4, 5, 7-11.