

BE-Alg. 2 TUESDAY 4-6-10

Simplify EACH expression, NAME THE EXPONENT RULE used.

① $x^{12} x^7 x^5$

② $\frac{x^{18}}{x^5}$

③ $(x^4)^9$

EVALUATE:

④ $\log_3 243$

Solve:

⑤ $\log_8 X = \frac{4}{3}$

ANS

① $x^{24} \Rightarrow$ Mult. Rule $\Rightarrow$ ADD exp.

② $x^{13} \Rightarrow$ Division Rule $\Rightarrow$ subtr. exp.

③ $x^{36} \Rightarrow$ Power - Power Rule $\Rightarrow$ MULT exp.

What is a logarithm?

④ $3^x = 343$ $x = 5$

Keep THIS
in mind for
later

⑤ $8^{\frac{4}{3}} = X \therefore (\sqrt[3]{8})^4 = \boxed{16}$

OK $\log_8 16 = \frac{4}{3}$, $8^{\frac{4}{3}} = 16$ ✓

Alg. 2 Homework Review #4-13, Pg. 535

④ $5^4 = 625 \therefore \boxed{\log_5 625 = 4}$

⑤ $7^{-2} = \frac{1}{49} \therefore \boxed{\log_7 \left(\frac{1}{49}\right) = -2}$

⑥ $\log_3 81 = 4 \therefore \boxed{3^4 = 81}$

⑦ $\log_{36} 6 = \frac{1}{2} \therefore \boxed{36^{\frac{1}{2}} = 6}$

⑧ $\log_4 256 \Rightarrow 4^x = 256 \therefore x = 4$

$\therefore \boxed{\log_4 256 = 4}$

⑨ $\log_2 \frac{1}{8} \Rightarrow 2^x = \frac{1}{8} \therefore x = -3$

$\therefore \boxed{\log_2 \frac{1}{8} = -3}$

⑩ $3^{\log_3 21} \Rightarrow \log_3 21$ is an exponent, it is the exponent of 3 that gives you 21 $\therefore 3^{\log_3 21} = \boxed{21}$

See ex 4 (4b) $3^{\log_3 (4x-1)} = 4x-1$
Pg 533

$\boxed{\text{GENERAL: } b^{\log_b X} = X}$ Logic

⑪. $\log_5 5^{-1} = \boxed{-1}$

↳ 5 raised to what power would equal 5^{-1} ??

See Ex 4
Pg 533

④A $\log_6 6^8 = 8$

General: $\log_b b^x = x$

⑫ $\log_9 X = \frac{3}{2} \quad \therefore 9^{\frac{3}{2}} = X$

CK $\log_9 27 = \frac{3}{2}$
 $9^{\frac{3}{2}} = 27 \checkmark$

$2\sqrt{9^3}$ or $(2\sqrt{9})^3 = \boxed{27}$

⑬ $\log_{\frac{1}{10}} X = -3 \quad \therefore \left(\frac{1}{10}\right)^{-3} = X$

$\frac{1}{\left(\frac{1}{10}\right)^3} = X$

$\frac{1}{\frac{1}{1000}} = X$

CK $\log_{\frac{1}{10}} 1000 = -3$

$\left(\frac{1}{10}\right)^{-3} = 1000$

$\frac{1}{\left(\frac{1}{10}\right)^3} = \frac{1}{\frac{1}{1000}} = 1000 \checkmark$

$\boxed{1000 = X}$

The logarithmic function

$$y = \log_b X$$

Requires b , the base: $b > 0$
 $b \neq 1$

And $X > 0$ Why $X > 0$?

Try $y = \log_5 125$

$$125 = 5^y \quad \therefore y = 3 \quad \text{OK.}$$

Try $y = \log_5 (-125)$

$$-125 = 5^y$$

↑

How is RAISING 5 to any y value going to change the positive base to a negative.

It cannot, $\therefore X > 0$

And $b > 0$

$b \neq 1$

4.
Checking inverses:

Let $y = f(x) = b^x$ Exponential function

$$f^{-1}(x) \Rightarrow x = b^y$$

$$\Rightarrow \log_b x = y$$

Let $y = g(x) = \log_b x$ logarithmic function

Show $f[g(x)] = g[f(x)] = x$

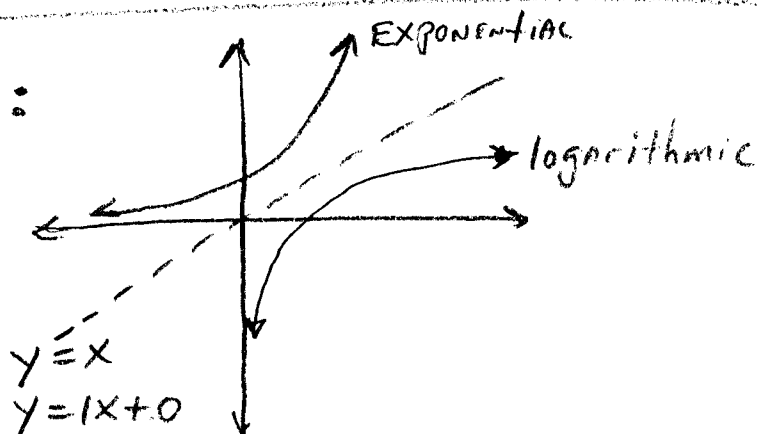
$$f(x) = b^x$$

$$f(\log_b x) = b^{\log_b x} = x \checkmark$$

$$g(x) = \log_b x$$

$$g(b^x) = \log_b b^x = x \checkmark$$

GENERAL:



Suppose: $\log_3 X = \log_3 81$

What must be true?

Recall: • A logarithm is an exponent.
• All exponents have bases

$$\log_3 X = \log_3 81$$

The exponent = the exponent
of base 3 of base 3 that
that produces X produces 81

$$\therefore X = 81$$

EX7
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Solve $\log_5 (p^2 - 2) = \log_5 P$

$$\therefore p^2 - 2 = P$$

$$p^2 - p - 2 = 0$$

$$\text{Sum} \Rightarrow -1$$

$$\text{prod} \Rightarrow -2$$

$$+1 -2$$

$$(p+1)(p-2) = 0 \quad p = \{-1, 2\}$$

$$\text{CK } \log_5 ((-1)^2 - 2) = \log_5 (-1)$$

UNDEFINED $\therefore$ EXTRANEOUS SOLUTION

$$\text{CK } \log_5 ((2)^2 - 2) = \log_5 2$$

✓

Pg. 535 # 18-20.

$$\begin{array}{ccc} L = 10 \log_{10} R \\ \uparrow & & \uparrow \\ \text{LOUDNESS,} & & \text{RELATIVE INTENSITY OF SOUND} \\ \text{in decibels} & & \end{array}$$

⑮ Solve $\frac{130}{10} = \frac{10 \log_{10} R}{10}$ for R

$$13 = \log_{10} R$$

$$\boxed{10^{13} = R} \text{ FIREWORKS}$$

⑯ Solve $75 = 10 \log_{10} R$ for R

$$7.5 = \log_{10} R$$

$$\boxed{10^{7.5} = R} \text{ concert between } 10^7 \text{ and } 10^8$$

⑰ RATIO? $\frac{10^{13}}{10^{7.5}} = \boxed{10^{5.5}}$ $10^5 < 10^{5.5} < 10^6$

$$100,000 < X < 1,000,000$$

$$X \approx 316,228$$

Homework: Pg 536 # 21-24, 30-32, 39, 40, 47, 50, 54.