

### Properties of Logarithms

For all positive numbers  $m$ ,  $n$ , and  $b$ , where  $b \neq 1$ ,

$$\log_b mm = \log_b m + \log_b n$$

$$\log_b \frac{m}{n} = \log_b m - \log_b n$$

For any real number  $p$  and positive numbers  $m$  and  $b$ , where  $b \neq 1$ , **Power Property of Logs**

$$\log_b m^p = p \cdot \log_b m$$

Logs don't cancel!

$$\log_5 X^2 - 144 = 2$$

$$S^2 = X^2 - 144$$

$$F) \log_5 (x-12) + \log_5 (x+12) = 2$$

$$(x-12)(x+12) = 2$$

$$x^2 - 144 = 2$$

$$x^2 - 144 = 5^2$$

$$\log_2 x - 3 \log_2 5 = 2 \log_2 10$$

$$\frac{x}{5^3} = 10^2$$

$$\frac{x}{125} = 100$$

$$x = 12,500$$

Solve for x:

$$E) 2 \log_3 6 - \frac{1}{2} \log_3 16 = \log_3 x$$

$$\log_3 \left( \frac{6^2}{16^{1/4}} \right) = \log_3 x$$

$$G) \log_{10} x = 1 - \log_{10} (x+3)$$

$$x(x+3) = 1$$

$$\log_{10} x^2 + 3x = 1$$

$$10^1 = x^2 + 3x = 10$$

$$x^2 + 3x - 10$$

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

$$\log_8 X^4 = \log_8 81$$

$$\log_2 5x = \log_2 15$$

Solve for  $x$  - Check all answers since you can not take the log of a negative number!!

- A)  $4 \log_8 x = \log_8 81$
- B)  $\log_2 5 + \log_2 x = \log_2 15$
- C)  $\log_5 20 - \log_5 2x = \log_5 2$
- D)  $\log_{10} 7 + \log_{10} (x-2) = \log_{10} 6x$

$$X^4 = 81$$

$$X = 3$$

$$\log_5 \left( \frac{20}{2x} \right) = \log_5 2$$

$$20 = 4x$$

$$5 = x$$

$$\log_2 5x = 15$$

$$X = 3$$

$$\log_{10} 7(x-2) = \log_{10} 6x$$

$$7x - 14 = 6x$$

$$-4 = -x$$

$$X = 14$$

Solve:

$$I) \log_2 4 - \log_2 (x+3) = \log_2 8$$

$$\frac{4}{x+3} = 8$$

$$4 = 8x + 24$$

$$-20 = 8x$$

$$\frac{-20}{8} = x$$

$$H) \log_{10} (x+3) - \log_{10} (2x-1) = \log_{10} 2$$

$$\frac{x+3}{2x-1} = 2$$

$$x+3 = 4x-2$$

$$5 = 3x$$

$$\frac{5}{3} = x$$