

10th Grade Assignment – Week #25

Please Note:

- For all work this week, you should only use your calculator (if at all) for multiplication and division.

Individual Work

- Do the problems from **Problem Set #1** in the *Logarithms – Part II* unit.
- Finish anything from the “Group Assignment” that your group doesn’t complete.

Group Assignment

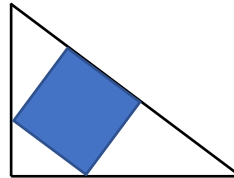
for Tuesday

- Do the problems from **Problem Set #2** in the *Logarithms – Part II* unit.

for Thursday

- Do the problems from **Problem Set #3** in the *Logarithms – Part II* unit.
(Note that problems #1-4 were done in lecture #2.)

- (If you have time) *Puzzle!*
Find the area of the shaded square, given that the outer triangle has sides of length 3, 4, 5.



Logarithms – Part II

Problem Set #1

Review

Calculate each. Use the *Power and Base Tables*, if needed. No Calculators!

- 1) $(\frac{2}{3})^{-1}$
- 2) $(\frac{2}{3})^0$
- 3) $(\frac{2}{3})^3$
- 4) $(\frac{2}{3})^{-3}$
- 5) 400^2
- 6) 400^{-2}
- 7) $400^{\frac{1}{2}}$
- 8) $400^{-\frac{1}{2}}$
- 9) $1,000,000^{\frac{1}{2}}$
- 10) $1,000,000^{\frac{1}{3}}$
- 11) $1,000,000^{-\frac{1}{3}}$
- 12) $1,000,000^{-\frac{2}{3}}$
- 13) $64^{-\frac{1}{2}}$
- 14) $64^{\frac{5}{2}}$
- 15) $64^{-\frac{4}{3}}$
- 16) $64^{-\frac{5}{6}}$
- 17) $64^{-\frac{2}{3}}$
- 18) $\log_4 16$
- 19) $\log_3 27$
- 20) $\log_3 81$
- 21) $\log_{49} 7$
- 22) $\log_7 49$
- 23) $\log_{16} 4$
- 24) $\log_4 64$
- 25) $\log_{64} 4$
- 26) $8^{\frac{1}{3}}$
- 27) 8^3
- 28) $8^{-\frac{1}{3}}$
- 29) 8^{-3}
- 30) $\log_5 25$
- 31) $\log_{10} 10000$
- 32) $\log_3 \frac{1}{3}$
- 33) $\log_2 \frac{1}{4}$
- 34) $\log_8 (\frac{1}{8})$
- 35) $\log_8 64$
- 36) $\log_2 1024$
- 37) $\log_8 512$
- 38) $\log_8 (\frac{1}{512})$
- 39) $\log_8 2$
- 40) $\log_8 (\frac{1}{2})$
- 41) $\log_8 0$
- 42) $\log_9 81$
- 43) $\log_9 (\frac{1}{81})$
- 44) $\log_9 3$
- 45) $\log_9 (\frac{1}{3})$
- 46) $\log_9 27$
- 47) $\log_9 (-3)$
- 48) Change to exponent form:
Example: $\log_2 8 = 3$
Solution: $2^3 = 8$
 - a) $\log_4 64 = 3$
 - b) $\log_{10} 0.1 = -1$
 - c) $\log_{16} (\frac{1}{4}) = -\frac{1}{2}$
- 49) Change to log form:
 - a) $6^2 = 36$
 - b) $6^{-2} = \frac{1}{36}$
 - c) $16^{\frac{3}{4}} = 8$

Power and Base Tables

2nd Power

<u>N</u>	<u>N²</u>
1	1
2	4
3	9
4	16
5	25
6	36
7	49
8	64
9	81
10	100

3rd Power

<u>N</u>	<u>N³</u>
1	1
2	8
3	27
4	64
5	125
6	216
7	343
8	512
9	729
10	1000

4th Power

<u>N</u>	<u>N⁴</u>
1	1
2	16
3	81
4	256
5	625
6	1296
7	2401
8	4096
9	6561
10	10000

5th Power

<u>N</u>	<u>N⁵</u>
1	1
2	32
3	243
4	1024
5	3125
6	7776
7	16807
8	32768
9	59049
10	100000

Base 2

<u>N</u>	<u>2^N</u>
1	2
2	4
3	8
4	16
5	32
6	64
7	128
8	256
9	512
10	1024

Base 3

<u>N</u>	<u>3^N</u>
1	3
2	9
3	27
4	81
5	243
6	729
7	2187
8	6561
9	19683
10	59049

Base 4

<u>N</u>	<u>4^N</u>
1	4
2	16
3	64
4	256
5	1024
6	4096
7	16384
8	65536

Base 5

<u>N</u>	<u>5^N</u>
1	5
2	25
3	125
4	625
5	3125
6	15625
7	78125

Base 6

<u>N</u>	<u>6^N</u>
1	6
2	36
3	216
4	1296
5	7776
6	46656

Base 7

<u>N</u>	<u>7^N</u>
1	7
2	49
3	343
4	2401
5	16807
6	117649

Base 8

<u>N</u>	<u>8^N</u>
1	8
2	64
3	512
4	4096
5	32768
6	262144

Base 9

<u>N</u>	<u>9^N</u>
1	9
2	81
3	729
4	6561
5	59049
6	531441

Problem Set #2

Calculate each.

- 1) 9^2
- 2) $9^{1/2}$
- 3) 9^{-2}
- 4) $9^{-1/2}$
- 5) $8,000,000^{1/3}$
- 6) $8,000,000^{-1/3}$
- 7) $8,000,000^{2/3}$
- 8) $8,000,000^{-2/3}$
- 9) $1,000,000,000,000^{1/4}$
- 10) $\log_3 9$
- 11) $\log_2 16$
- 12) $\log_4 (1/4)$
- 13) $\log_4 1$
- 14) $\log_4 2$
- 15) $\log_4 (1/16)$
- 16) $\log_4 (-1/2)$
- 17) $\log_{25} (1/5)$
- 18) $\log_6 \sqrt{6}$

19) Change to exponent form:

Example: $\log_2 8 = 3$

Solution: $2^3 = 8$

- a) $\log_{10} 100000 = 5$
 - b) $\log_4 (1/64) = -3$
 - c) $\log_3 4x = 5$
- 20) Change to log form:
- a) $7^3 = 343$
 - b) $8^{-3} = \frac{1}{512}$
 - c) $9^{4x+7} = 285$
- 21) $\log_{100} 1000000$
 - 22) $\log_{100} 10$
 - 23) $\log_{100} 1000$
 - 24) $\log_{100} 0.1$
 - 25) $\log_{100} 0.01$
 - 26) $\log_{100} 0.001$

- 27) $\log_9 729$
- 28) $\log_9 (1/729)$
- 29) $\log_3 (1/729)$
- 30) $\log_9 (1/3)$
- 31) $\log_3 (1/9)$
- 32) 36^2
- 33) $36^{1/2}$
- 34) 36^{-2}
- 35) $36^{-1/2}$
- 36) $\log_8 16$
- 37) $\log_8 4$
- 38) $\log_2 0$
- 39) $\log_8 1$
- 40) $\log_{37} (1/37)$
- 41) $\log_{81} 3$
- 42) $\log_8 (1/256)$
- 43) $\log_5 (-25)$
- 44) $\log_{25} (1/125)$
- 45) $\log_{27} 81$
- 46) $\log_{81} (1/27)$

Solve for X. It may help to rewrite the equation in exponential or log form.

- 47) $3^X = 81$
- 48) $x^4 = 16$
- 49) $10^X = \frac{1}{1000}$
- 50) $\log_x 8 = 3$
- 51) $2^{3X-1} = 32$
- 52) $\log_4 x = -2$
- 53) $\log_3 9x = 5$
- 54) $2 + 3 \log_8(1-2x) = 0$
- 55) $\frac{1}{8} 10^{4x-7} - 70 = 55$

Problem Set #3

Deriving the Laws of Logarithms!

Calculate each. Use the *Power and Base Tables*, as needed.

- 1) a) $\log_2 16$
b) $\log_2 64$
c) $\log_2 (64 \cdot 16)$
- 2) a) $\log_{10} 1000$
b) $\log_{10} 100,000$
c) $\log_{10} (100,000 \cdot 1000)$
- 3) $\log_3 (9 \cdot 27)$
- 4) Derive a Law of Logarithms!
 $\log_b (M \cdot N) =$
- 5) a) $\log_{10} 100,000$
b) $\log_{10} 1000$
c) $\log_{10} (100,000 \div 1000)$
- 6) a) $\log_3 2187$
b) $\log_3 243$
c) $\log_3 (2187 \div 243)$
- 7) $\log_2 (512 \div 32)$
- 8) Derive a Law of Logarithms!
 $\log_b (M \div N) =$
- 9) a) $\log_2 8$
b) $\log_2 (8^3)$
- 10) a) $\log_{10} 1000$
b) $\log_{10} (1000^5)$
- 11) $\log_3 (9^7)$
- 12) Derive a Law of Logarithms
 $\log_b (N^k) =$
- 13) a) $\log_2 8$
b) $\log_2 (1/8)$
- 14) a) $\log_{10} 100,000$
b) $\log_{10} (\frac{1}{100000})$
- 15) How are $\log_b (1/N)$ and $\log_b N$ related to one another?
Write a Law of Logarithms that expresses this.
- 16) a) $\log_3 81$
b) $\log_{81} 3$
- 17) a) $\log_{10} 100$
b) $\log_{100} 10$
- 18) How are $\log_a b$ and $\log_b a$ related to one another?
Write a Law of Logarithms that expresses this.
- 19) $\log_3 (3^7)$
- 20) $\log_{10} (10^6)$
- 21) Derive a Law of Logarithms
 $\log_b (b^k) =$
- 22) $5^{\log_5 625}$
- 23) $10^{\log_{10} 1000}$
- 24) Derive a Law of Logarithms
 $b^{\log_b N} =$
- 25) What can the following
Logarithm Law be used for?
 $\log_a x = \frac{\log_b x}{\log_b a}$