1. **Logarithm:**

If *a* is a positive real number, other than 1 and *am* = *x*, then we write:  
***m* = loga*x*** and we say that the value of log *x* to the base *a* is *m*.

**Examples:**

(i). 103 = 1000      log10 1000 = 3.

(ii). 34 = 81      log3 81 = 4.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| (iii). 2-3 = | 1 | log2 | 1 | = -3. |
| 8 | 8 |

(iv). (.1)2 = .01      log(.1) .01 = 2.

1. **Properties of Logarithms:**

1. loga (*xy*) = loga *x* + loga *y*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 2. loga |  | *x* |  | = loga *x* - loga *y* |
| *y* |

3. logx *x* = 1

4. log1/x *x* = -1

5. loga 1 = 0

6. loga (*xn*) = *n*(loga *x*)

7. log (*x*) = *1/q*(loga *x*)

|  |  |
| --- | --- |
| 8. loga *x* = | 1 |
| logx *a* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 9. loga *x* = | logb *x* | = | log *x* | . |
| logb *a* | log *a* |

10. logx *y* logy *z* logz *p =* logx *p*

11. = x

12. =

13.  =

1. **Common Logarithms:**

Logarithms to the base 10 are known as common logarithms.

1. **Natural Logarithms:**

Logarithms to the base e are known as natural logarithms.