Contents

Basic Functions

Types of basic functions

The types of basic functions that can be expressed in terms of operations of functions are

- Exponential functions in terms of constant base
- Linear functions
- Exponential functions in terms of variable base
- Logarithmic functions
- Special Functions

Nature of exponential functions

- A exponential function has a constant base.
- The power of an exponential function is variable.
- The expression for exponential function is expressed as
- $$f(x) = a^x$$

Nature of linear functions

- A linear function has a term on x .
- The term in x of a linear function is in the power of 1 .
- The expression for linear function is expressed as
- $$f(x) = kx$$

Nature of exponential functions in terms of a variable base

- A exponential function in terms of a variable base has a constant power.
- The expression for exponential functions in terms of variable base is expressed as
- $$f(x) = x^n$$

Nature of logarithmic function

- A logarithmic function is an inverse function.
- The function of which the logarithmic function is a inverse of is exponential function.
- The expression for logarithmic function is
- $$f(x) = \log_a(x)$$

Nature of special functions

- A special function in operation of basic function is a special case.
- The expression for special function in operations of basic function is

$$f(x) = \begin{cases} 1 + x^n \\ 1 - x^n \end{cases}$$

Derivation on Operations on exponential functions in terms of constant base

$$\begin{aligned} f(x) &= a^x \\ f(y) &= a^y \\ f(x+y) &= a^{x+y} \\ f(x+y) &= a^x \times a^y \end{aligned}$$

Expression for Operations on exponential functions in terms of constant base

- A expression for the operation with a function satisfying relation in terms of a constant base is
- $$f(x+y) = f(x)f(y) \implies f(x) = a^x$$

Derivation on Operations on linear functions

$$
\begin{aligned}
f(x) &= kx \\
f(y) &= ky \\
f(x+y) &= k(x+y) \\
f(x+y) &= kx+ky
\end{aligned}
$$

Expression for Operations on linear functions

- The expression for the operation with a function satisfying relation in terms of linear function is
- $$f(x+y) = f(x) + f(y) \implies f(x) = kx$$

Derivation on Operations on exponential functions in terms of variable base

$$
\begin{aligned}
f(x) &= x^n \\
f(y) &= y^n \\
f(xy) &= (xy)^n \\
f(x+y) &= x^n \times y^n
\end{aligned}
$$

Expression for Operations on exponential functions in terms of variable base

- The expression for the operation with a function satisfying relation in terms of exponential function with variable base is
- $$f(xy) = f(x) \times f(y) \implies f(x) = x^n$$

Derivation on Operations of logarithmic functions

$$
\begin{aligned}
f(x) &= \log_a(x) \\
f(y) &= \log_a(y) \\
f(xy) &= \log_a(xy) \\
f(xy) &= \log_a(x) + \log_a(y)
\end{aligned}
$$

Expression for Operations of logarithmic functions

- The expression for the operation with a function satisfying the relation in terms of logarithmic functions is
-

$$f(xy) = f(x) + f(y) \implies f(x) = \log_a(x)$$

Expression for Special functions

- The expression for special functions is

$$f(x) \times f(\frac{1}{x}) = f(x) + f(\frac{1}{x}) \implies f(x) = \begin{cases} 1 + x^n \\ 1 - x^n \end{cases}$$