

PROPERTIES OF EXPONENTIAL FCTS

(59a)

$$f(x) = a^x$$

ALLOWABLE BASES:  $a > 0, a \neq 1$

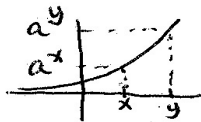
RANGE:  $(0, \infty)$  ;  $a^x > 0$  STRICT! FOR ALL  $x$

DOMAIN:  $(-\infty, \infty)$  ; EXPONENTIAL FCTS ARE DEFINED EVERYWHERE

ONE-TO-ONE FCTS

FOR  $a > 1$ :

INCREASING



$x < y$   
IS EQUIVALENT TO  
 $a^x < a^y$

FOR  $0 < a < 1$ :

DECREASING



$x < y$   
IS EQUIVALENT TO  
 $a^x > a^y$

KEY PROPERTY OF EXPONENTIAL FCTS

(59b)

$$f(x) = 2^x$$

$x$	$2^x$
-2	$\frac{1}{4}$
-1	$\frac{1}{2}$
0	1
1	2
2	4
3	8

$\Delta x = 1$  is indicated by arrows between rows, and a multiplier of  $\cdot 2$  is shown next to the transitions.

$$a = 2$$

$$\Delta x = 1$$

$$a^{\Delta x} = 2^1 = 2$$

$$\text{LET } f(x) = a^x$$

$$\begin{aligned} \text{THEN } f(x + \Delta x) &= a^{x + \Delta x} \\ &= a^x a^{\Delta x} \\ &= a^{\Delta x} \cdot f(x) \end{aligned}$$

WHEN  $x$  CHANGES BY  $\Delta x$

$$(x, y) \longrightarrow (x + \Delta x, a^{\Delta x} y)$$

$y$  GETS MULTIPLIED BY A SCALING FACTOR

↑ SCALING FACTOR