

PROPERTIES OF EXPONENTIAL FCTS

(59a)

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

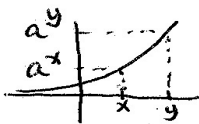
ALLOWABLE BASES: $a > 0, a \neq 1$

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. Multiplication by 2 is indicated by arrows between columns.

$$a = 2$$

$$\Delta x = 1$$

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

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 Δx

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

y GETS MULTIPLIED BY A SCALING FACTOR

SCALING FACTOR