

Exponential Functions

Difference between a :

power function : variable base with
numeric exponent

exponential function : numeric base
with variable
exponent

Power function:

$$y = x^2, y = x^3, y = \sqrt{x} \text{ or } y = x^{1/2}$$

Exponential function:

$$y = 2^x, y = \frac{1}{3}^x$$

general form:

$$y = b^x$$

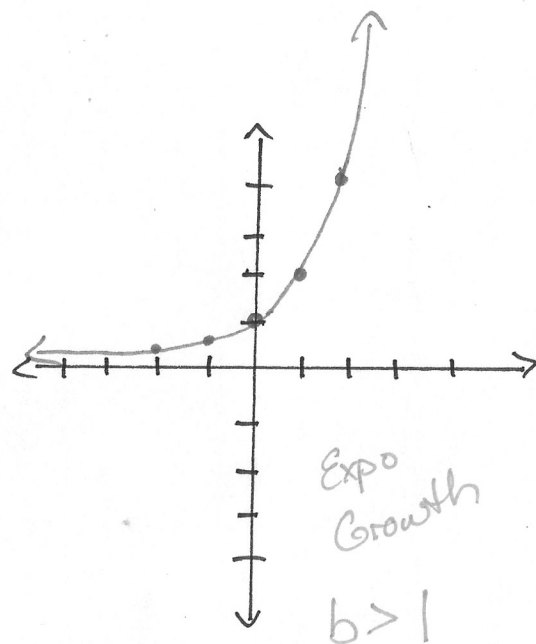
numeric base

variable expo

Exponential functions

Given: $y = 2^x$

x	y
-2	1/4
-1	1/2
0	1
1	2
2	4



Properties

Domain: \mathbb{R} or $(-\infty, \infty)$

Range: $(0, \infty)$

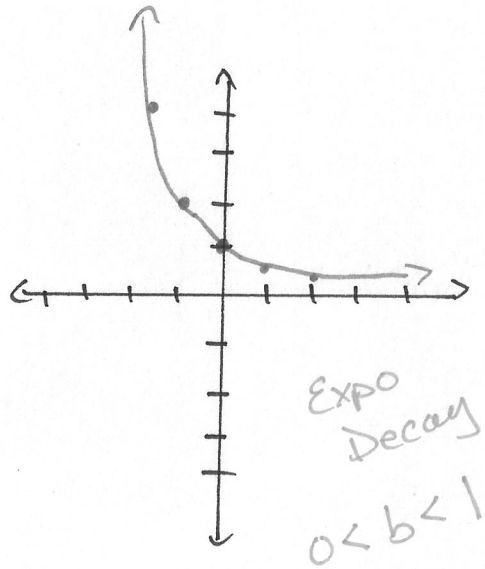
Asymptote: $y = 0$

y-int: $(0, 1)$ point

Description: increasing

Ex: $y = \left(\frac{1}{2}\right)^x$

x	y
-2	4
-1	2
0	1
1	1/2
2	1/4



Properties

Domain: \mathbb{R} or $(-\infty, \infty)$

Range: $(0, \infty)$

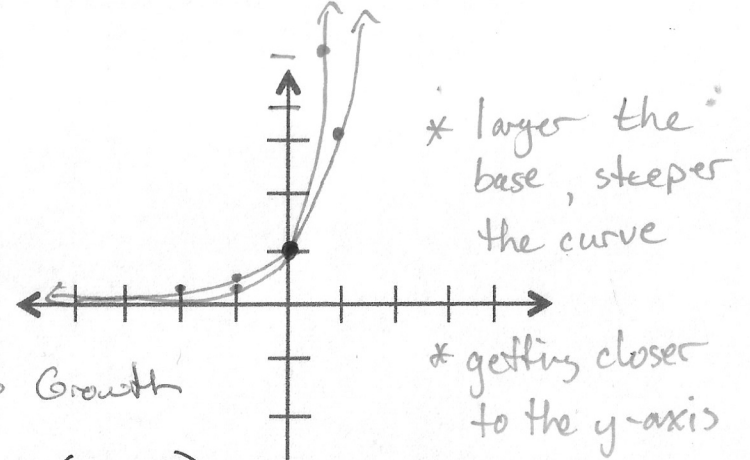
Asymp: $y = 0$

y-int: $(0, 1)$

Description: Decreasing

$y = 3^x$

$y = 5^x$



D: \mathbb{R} or $(-\infty, \infty)$

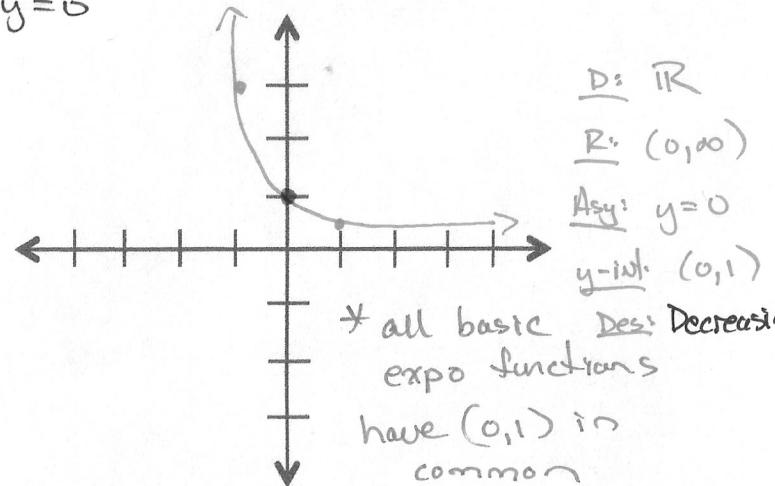
R: $(0, \infty)$

Asymp: $y = 0$

y-int: $(0, 1)$

Descript: Increasing

$y = \left(\frac{1}{3}\right)^x$



D: \mathbb{R}

R: $(0, \infty)$

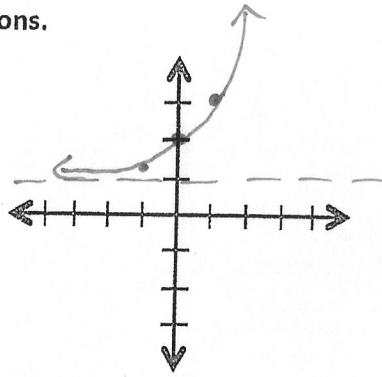
Asy: $y = 0$

y-int: $(0, 1)$

Des: Decreasing

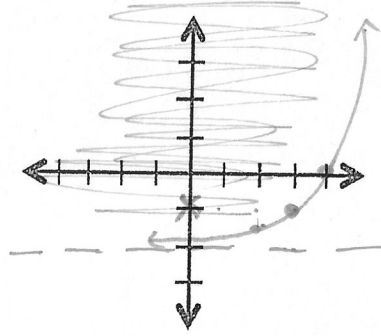
Graph the following functions.

1) $y = 2^x + 1$



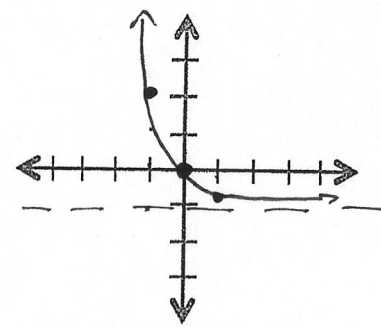
2) $y \geq 2^{x-3} - 2$

shade
 $\geq >$ above
 $\leq <$ below



3) $y = (\frac{1}{3})^x - 1$

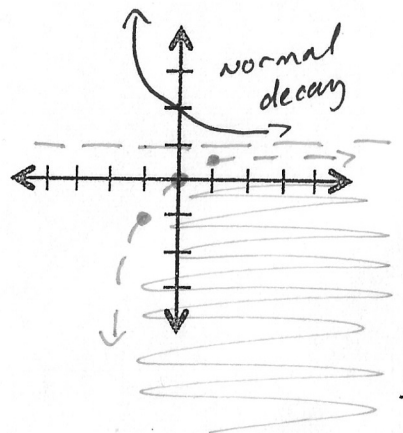
Decay



$y < -\frac{1}{2}^x + 1$

4) $y < -2^{-x} + 1$

below
 Asymp



The number 'e'

Def: irrational # that derives from the sum of an infinite series

series: $1 + \frac{1}{1} + \frac{1}{1 \cdot 2} + \frac{1}{1 \cdot 2 \cdot 3} + \dots$

$e \approx 2.718$

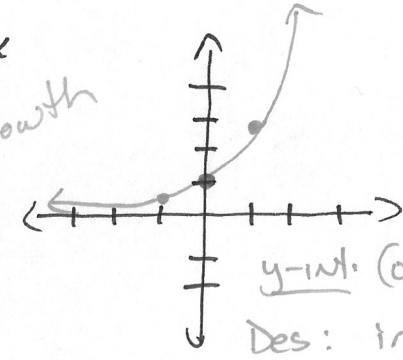
Graph $y = e^x$

Growth

D: \mathbb{R}

R: $(0, \infty)$

Asy: $y = 0$



y-int: $(0, 1)$

Des: increasing

$y = \frac{1}{e}^x$

Decay

