Algebra 2H
8.3 The Number e

NOTES

Name________________________________

The number e is the natural base e or Euler number.

$e^{(x)}$ ← 1

2nd $\boxed{\ln}$ $\boxed{\ln}$

1 2nd $\boxed{\ln}$

Investigating the value of e

n	$e = \left(1+\frac{1}{n}\right)^n$, as $n \to +\infty$
100	$e = (1.01)^{100} \approx 2.7048$
10,000	$e = (1.0001)^{10{,}000} \approx 2.7181$
1,000,000	$e = (1.000001)^{1{,}000{,}000} \approx \boxed{2.7183 \approx e^1}$

Natural base exponential function (see text, p. 481)

$y = ae^{rx}$, if $a > 0$, and $r > 0$ exponential growth

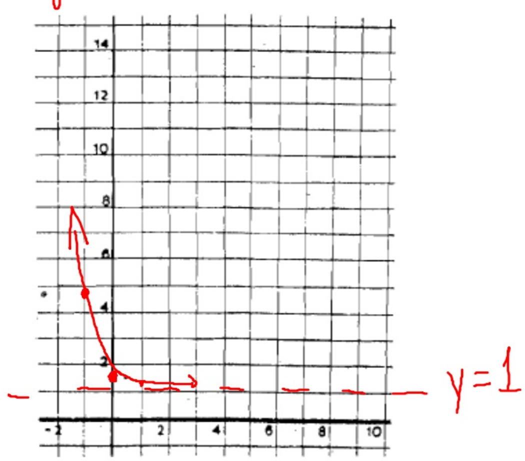
if $a > 0$, and $r < 0$ exponential decay

Example 1. Graph $y = \frac{1}{2}e^{-2x} + 1$ decay

x	y
0	1.5
-1	≈4.7
1	≈1.1

$\frac{1}{2}e^{2}+1$

$\frac{1}{2}e^{-2}+1$



Example 2 Continuously Compounded Interest $A = Pe^{rt}$

You deposit $5000 at an annual interest rate of 4.5%, compounded continuously. What is the balance at the end of 3 years?

$A = 5000e^{(.045)(3)}$

$A = 5000 \cdot e^{.135} \approx \$5{,}722.68$

Example 3

Simplify: $\frac{24e^5}{8e^8} = \frac{3}{e^3}$

$\left(2e^{-5x}\right)^{-2}$ $2^{-2}e^{10x} = \frac{e^{10x}}{4}$

$e^4 \cdot e^{3x-1}$ e^{3x+3}