Algebra 2-H
Section 8.3
The Number *e*

NOTES

Name_____

Date_____

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

Investigating the value of e.

$e^{\otimes 1}$

ln natural log

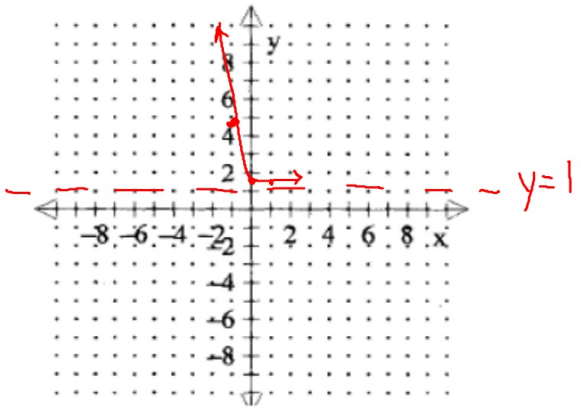
n	$e = \left(1 + \frac{1}{n}\right)^n$, as $n \to +\infty$
100	$e = (1.01)^{100} \approx 2.70481$
1000	$e = (1.001)^{1000} \approx 2.71692$
10,000	$e = (1.0001)^{10,000} \approx 2.71815$
1,000,000	$e = (1.000001)^{1,000,000} \approx 2.71828$

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

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

$y = ae^{rx}$, if $a > 0$ and $r < 0$, exponential decay (−)

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



x	y
0	1.5
−1	4.7
1	1.1

D: x is all real #s

R: $y > 1$

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

If $50,000 is invested at an annual interest rate of 4.5%, compounded continuously, what is the balance at the end of 3 years?

P r t

$A = 50{,}000e^{(.045)3}$

$50{,}000e^{.135}$

$A \approx \$57{,}226.84$

Example 3 **Simplify:**

a) $\dfrac{24e^{5}}{8e^{8}} = \dfrac{3}{e^{3}}$

b) $\left(2e^{-5x}\right)^{-2} \quad \dfrac{1}{(2e^{-5x})^2} = \dfrac{e^{10x}}{4}$

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