Chapter 5: Section 3 and 4

Exponential Functions

$f(x) = ab^x$ where $a > 0$

Growth if …

$b > 0$ and $b \neq 1$

Decay if …

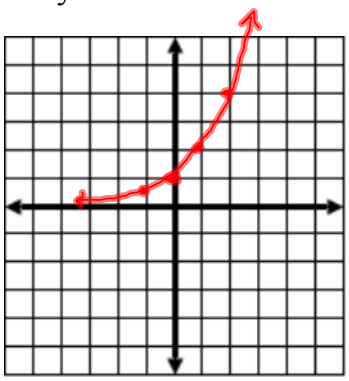
$0 < b < 1$

Example $y = 2^x$

a = 1

b = 2

x	y
0	1
-1	$2^{-1} = \frac{1}{2}$
1	2
2	4

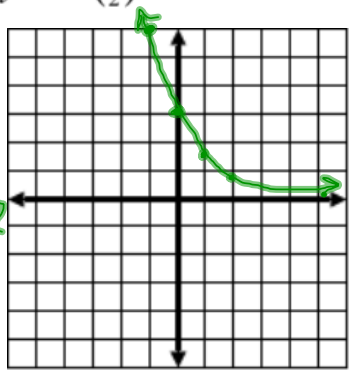


Example $y = 3\left(\frac{1}{2}\right)^x$

a = 3

b = 1/2

x	y
-2	$3(1/2)^{-2} = 12$
-1	6
0	3
1	3/2
2	3/4



Dec 16-12:07 PM

Growth

Use: Finances and bacteria growth

Decay

Use: Half-life, sciences

Asymptote: The line the graph never crosses;
for exponential functions it's the x-axis

x-axis equation is y = 0

Dec 16-12:10 PM

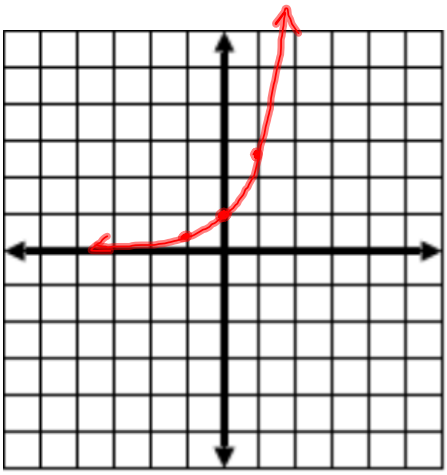
The Number *e*

e is called the **Euler** number after Swiss mathematician Leonard Euler (1700's)

$e \approx 2.718$

Graph $y = e^x$

x	y
-1	$e^{-1} = \frac{1}{e}$
0	1
1	$e^1 \approx 2.718$



Use: Finances (CD's and bonds)
Biology (continuous growth)

Dec 16-12:14 PM

Compound Interest *Continuously*

$A = Pe^{rt}$ A = Final Amount P = Initial Amount

r = Rate (APR) t = Time (years)

Example

Jack and Diane are going to start a CollegeSure CD (certificate of deposit) at their bank for their newborn daughter. The particular CD they opened pays a continuous rate of 6.5% and requires a minimum deposit of $2500.

$r = .065$

If Jack and Diane's daughter begins college at the age of 18, how much money will she have earned from the CD when she goes to college?

$A = 2500e^{(.065)18}$

$A = \$8054.98$

Dec 16-12:17 PM

HW

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Dec 16-12:19 PM