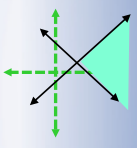
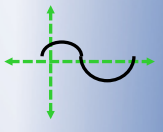
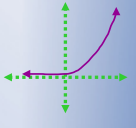
$5x-2y \leq 75$



$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$



$S = Pe^{rt}$



$APY = (1+\frac{r}{n})^{n}-1$

Math 1090 ~ Business Algebra

Section 4.2 Exponential Functions

Objectives:

- Identify and evaluate exponential functions.
- Evaluate the natural base *e* and graph natural exponential functions.
- Sketch transformations of an exponential function.
- Use an exponential function in a business application.

An exponential function has a variable in the exponent and a constant base.

ex $5^x = f(x)$

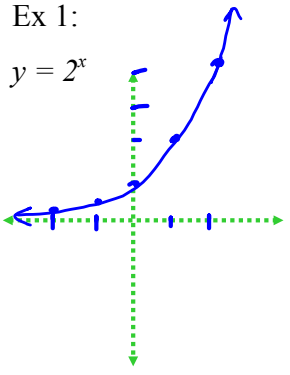
If $a \in \mathbb{R}$, $a > 0$ and $a \neq 1$, then $y = f(x) = a^x$ is an exponential function with base a.

(note: if $a=1$, we get $y=1^x$ which is always 1, and $y=1$ is a line, not an exponential fn.)

Graphs of exponential functions

Ex 1:

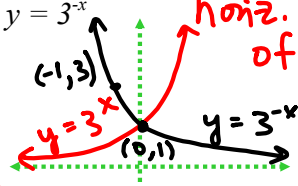
$y = 2^x$



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

Notice
- all the y-values are positive
- when we let $x \to -\infty$, we have HA of $y=0$
- it goes thru (0,1)

$y = 3^{-x}$



horiz. ref of $y = 3^x$

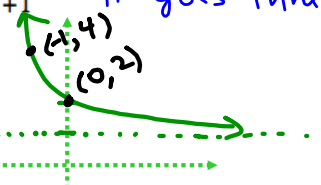
$y = 3^{-x} = \left(\frac{1}{3}\right)^x$

exp. growth

exp. decay

note: $3^{-x} = \frac{1}{3^x} = \left(\frac{1}{3}\right)^x$

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

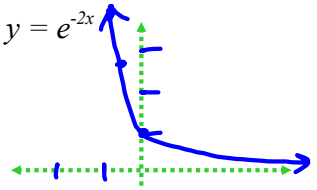


we have vert. shift up 1

as $x \to \infty$, then y approaches 1, not 0.

i.e. HA: $y=1$

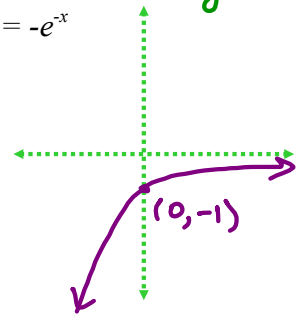
$y = e^{-2x}$

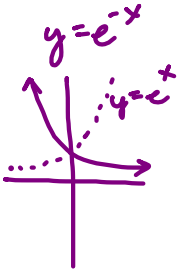


HA: $y=0$

$y=e^x$	e^{-x}	e^{-2x}
(0, 1)	(0, 1)	(0, 1)
(1, e)	(-1, e)	$(-\frac{1}{2}, e)$

$y = -e^{-x}$





HA: $y=0$

Ex 2: Label these as either power functions or exponential functions.

a) $y = 2^x$ E

const. base
variable exponent

b) $y = e^{2x}$ E

c) $y = -e^2$ P

constant

(we could say it's power fn of degree 0)

d) $y = -x^2 - x^3$ P

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

power fn: variable base and constant exponent

exponential fn: constant (positive, non-one) base with variable exponent

Ex 3: Simplify (these are exponential expressions)

a) $\frac{4^{2-x}}{4^{3+x}}$

$= (4)^{2-x-(3+x)}$

$= 4^{-1-2x}$

notice:

$4^{-1-2x} = 4^{-(1+2x)}$

$= \frac{1}{4^{1+2x}}$

b) $(2^{3x})^{(x-2)}$

$= 2^{3x(x-2)}$

$= 2^{3x^2-6x}$

* if you need to review rules of exponents, look in review section of video page

Ex 4: If \$10,000 is invested for t years at 10% interest, compounded continuously, the future value will be $S = 10{,}000e^{0.10t}$. What will this account be worth in 5 years?

$t = 5$ yrs

$S = 10{,}000e^{0.10(5)} \approx \$16{,}487.21$