Notes 8-7

Exponential Functions

Ex. 1:

Evaluate the exponential function $f(x) = 10 \cdot 5^x$ for the domain {-2, 0, 3}.

x	$10 \cdot 5^x$	f(x)
-2	$10 \cdot 5^{-2} = 10 \cdot \frac{1}{5^2} = 10 \cdot \frac{1}{25} = \frac{10}{25} = \frac{2}{5}$	$2/5$
0	$10 \cdot 5^0 = 10 \cdot 1 = 10$	10
3	$10 \cdot 5^3 = 10 \cdot 125 = 1250$	1250

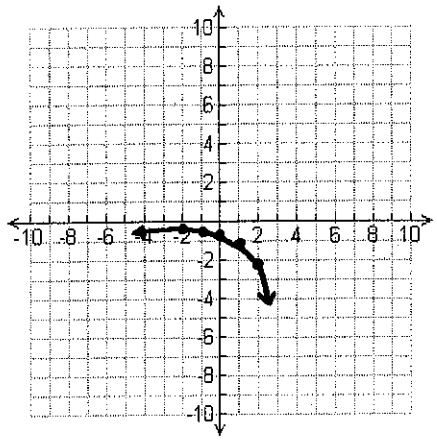
Ex. 2: Suppose 10 animals are taken to an island, and then the population of these animals quadruples every year. Use the function $f(x) = 10 \cdot 4^x$. How many animals would there be after 6 years?

$10 \cdot 4^6 = 10 \cdot 4096 =$ **40,960 animals**

Ex. 3:

Graph $y = -0.5 \cdot 2^x$

x	$-0.5 \cdot 2^x$	y	(x,y)
-2	$-0.5 \cdot 2^{-2} = -0.5 \cdot \frac{1}{2^2} = -0.5 \cdot \frac{1}{4} = \frac{-0.5}{4}$	-.125	(-2, -.125)
-1	$-0.5 \cdot 2^{-1} = -0.5 \cdot \frac{1}{2^1} = -0.5 \cdot \frac{1}{2} = \frac{-0.5}{2} =$	-.25	(-1, -.25)
0	$-0.5 \cdot 2^0 = -0.5 \cdot 1 = -0.5$	-0.5	(0, -0.5)
1	$-0.5 \cdot 2^1 = -0.5 \cdot 2 = -1$	-1	(1, -1)
2	$-0.5 \cdot 2^2 = -0.5 \cdot 4 = -2$	-2	(2, -2)



asymptote: a horizontal line that a graph approaches but does not cross.

Exponential graphs follow a few general rules: $y = a(b)^x$

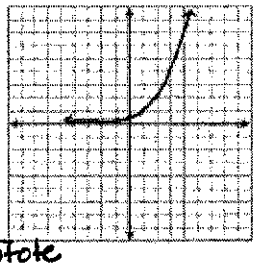
a is the y-intercept

an exponential graph will never cross the x-axis, it will only get very, very close to being horizontal and very, very close to the x-axis.

Ex. 4:

Graph each exponential function.

x	$y = 0.5(2)^x$
-2	$\frac{1}{2}(2)^{-2} = \frac{1}{2} \cdot \frac{1}{4} = \frac{1}{8}$
-1	$\frac{1}{2}(2)^{-1} = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$
0	$\frac{1}{2}(2)^0 = \frac{1}{2} \cdot 1 = \frac{1}{2}$
1	$\frac{1}{2}(2)^1 = \frac{1}{2} \cdot 2 = 1$
2	$\frac{1}{2}(2)^2 = \frac{1}{2} \cdot 4 = 2$



Domain: $-\infty < x < \infty$

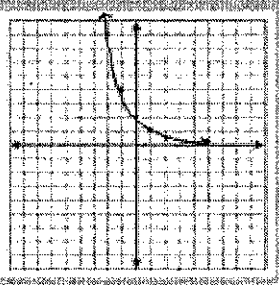
Range: $0 < y < \infty$

Asymptote: $y = 0$ → Will get close to 0, but never 0 for y ∴ not ≤ equation that is asymptote

Growth or Decay

$B > 1$

x	$y = 2\left(\frac{1}{2}\right)^x$
-2	$2\left(\frac{1}{2}\right)^{-2} = 2 \cdot 4 = 8$
-1	$2\left(\frac{1}{2}\right)^{-1} = 2 \cdot 2 = 4$
0	$2\left(\frac{1}{2}\right)^0 = 2 \cdot 1 = 2$
1	$2\left(\frac{1}{2}\right)^1 = 2 \cdot \frac{1}{2} = 1$
2	$2\left(\frac{1}{2}\right)^2 = 2 \cdot \frac{1}{4} = \frac{1}{2}$



Domain: $-\infty < x < \infty$

Range: $0 < y < \infty$

Asymptote: $y = 0$

Growth or Decay

$0 < B < 1$