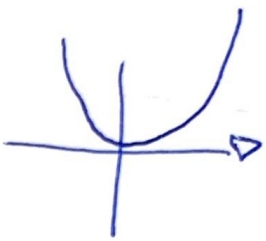
Chapter 4 Exponential & Logarithmic Functions

4.1 Exponential Functions

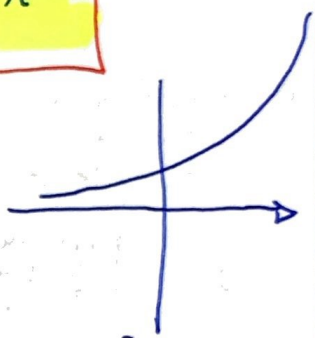
- power functions: $f(x) = x^2$



the base is a variable, x
the exponent is a constant, 2

- exponential functions $f(x) = 2^x$

the base is a constant
the exponent is a variable



For a table we can identify if a function is linear or exponential

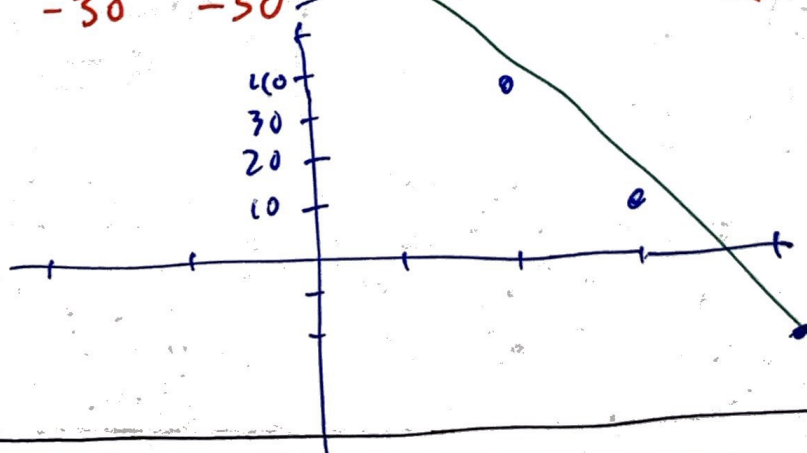
Ex

x	1	2	3	4
f	70	40	10	-20

1 1 1

-30 -30 -30

linear $m = \frac{\Delta y}{\Delta x} = \frac{-30}{1} = -30$

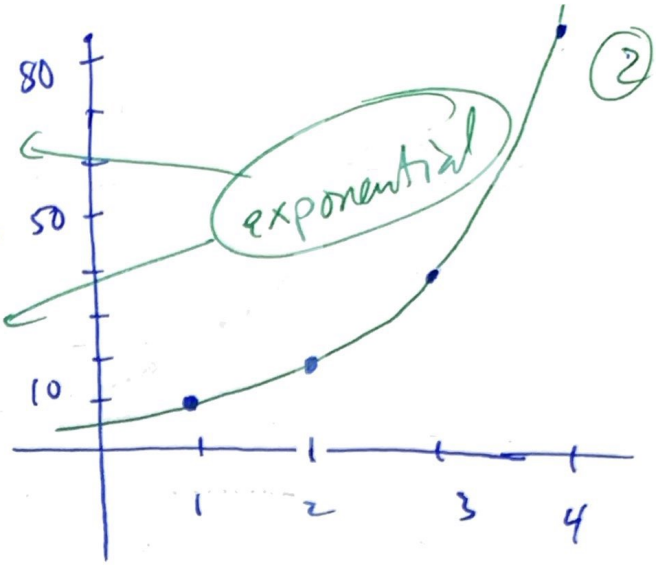


$f(x) = -30x + 100$

EX

x	1	2	3	4
f	10	20	40	80
		+10	+20	+40

Doubles



$$f(x) = a \cdot 2^x$$

$$\boxed{f(x) = 5 \cdot 2^x}$$

⊛ exponential functions describe growth and decay of biological, financial, radioactivity, ...

$$f(x) \propto a^x$$

rate of change of $f(x) \propto x$ — the more you have, the faster it grows!

ex grow of bunnies ∝ Number of Bunnies

EX radioactive decay

C_6^{14} decays → N_7

C_6^{12}

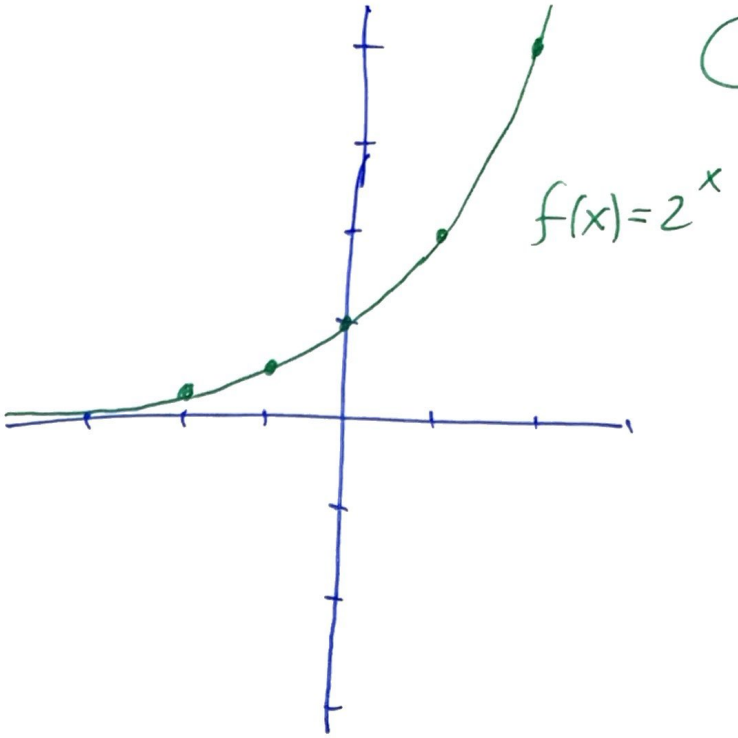
after time → decay

Nitrogen

C_6^{14}

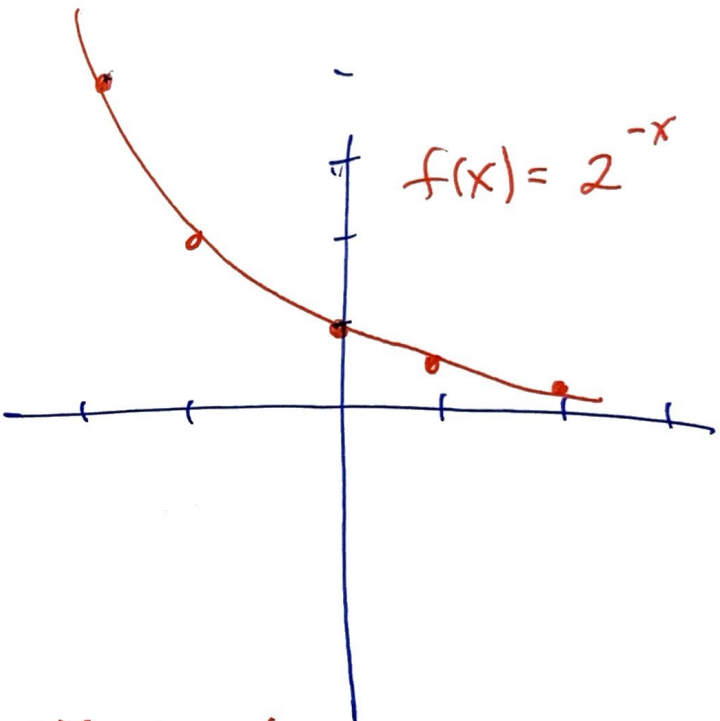
Basic Graphs

x	2^x
-2	$2^{-2} = 1/4$
-1	$2^{-1} = 1/2$
0	$2^0 = 1$
1	$2^1 = 2$
2	$2^2 = 4$



$f(x)=2^x$ is increasing (growth)

x	2^{-x}
-2	$2^{-(-2)} = 4$
-1	$2^{-(-1)} = 2$
0	$2^{-(0)} = 1$
1	$2^{-1} = 1/2$
2	$2^{-2} = 1/4$



$f(x)=2^{-x}$ is decay, decreasing.

EX

$f(x) = 4^{2x+3}$ growth, $f(x) = 2.25e^{-t}$ decay