EQUATIONS WITH POWERS

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pg. 499

12) Determine the value of the variable that satisfies each equation

a) $12^x = 1$ What's x? Ans: $x = 0$

b) $10^m = 100\,000$ m? $m = 5$

c) $10^x = 0.0001$ x? $x = -4$ $10^{-3} = 0.001$

$10^{-1} = \frac{1}{10} = 0.1$; $10^{-2} = \frac{1}{10^2} = \frac{1}{100} = 0.01$;

d) $2^k = \frac{1}{2}$ $k?$ $k = -1$

e) $2^e = \frac{1}{32}$ $e?$ $e = -5$

f) $2^{2a} = 64$ $a?$

$2^6 = 64 \Rightarrow 2a = 6$

$a = 3$

EXPONENTIAL GROWTH

x	f	g	h
−3	−7	9	0.125
−2	−5	4	0.25
−1	−3	1	0.5
0	−1	0	1
1	1	1	2
2	3	4	4
3	5	9	8
4	7	16	16
5	9	25	32

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1st Dif: 0.125, 0.250, 0.500

2nd Dif: 0.125, 0.250

h is neither linear nor quadratic

what type of functions are f & g?

1st Differences f: $-5-(-7)=2$, $-3-(-5)=2$, $-1-(-3)=2$

are constant for f

Hence f is linear function (straight line)

1st differences for g: $4-9=-5$, $1-4=-3$

Not constant

2nd differences $-3-(-5)=2$, $-1-(-3)=2$

CONSTANT

QUADRATIC FUNC

x	h
−3	0.125
−2	0.25
−1	0.5
0	1
1	2
2	4
3	8
4	16
5	32

Ratios of values

$\frac{0.250}{0.125} = 2$

$\frac{0.5}{0.25} = 2$

$\frac{1}{0.5} = 2$

We say that h grows by a constant multiplicative factor of 2

This is an example of an EXPONENTIAL FUNCTION

Exercise: In Geogebra, plot the function $f(x)=2^x$

x	f
−3	0.125
−2	0.25
−1	0.5
0	1
1	2
2	4
3	8
4	16
5	32

Mind you: This is different from the function $g(x)=x^2$

This is a power or polynomial function

In $f(x)=2^x$ the variable x is in the exponent.

Hence, f(x) is an exponential function

Exercise: In geogebra, plot the functions

$f(x) = \left(\frac{1}{2}\right)^x$ & $g(x) = \left(\frac{1}{10}\right)^x$

Describe the differences.

1) What's the y-intercept? y-intercept = 1 for both