Find your new seat

Happy New Year

Pick Up the yellow recording sheet if you were not in class on Fri 12/20

Agenda this Week

→ 4 day unit on skill transfer from Algebra 1 (sequences, expon. functions and exponents)

→ Start Ch. 2 on Friday

Agenda this Week

The first day was actually before the break.

→ 4 day unit on skill transfer from Algebra 1 (sequences, expon. functions and exponents)

→ Start Ch. 2 on Friday

first

let's refresh our memories from before the break.

before we start today's Lesson

Warm Up
- for your notes

Write en explicit formula for each sequence in both **first-term** and **zero-term** format.

160, 128, 128.8, 103.04, ...

1000, 1150, 1300, 1450, ...

$\frac{128}{160} = .8$ $\frac{128.8}{128} = .8$

200 160, 128, ~~128.8~~, 103.04, ...

zero-term $t_n = 200(.8)^n$

first-term $t_n = 160(.8)^{n-1}$

1000, 1150, 1300, 1450, ...

zero-term $t_n = 850 + 150n$

first-term $t_n = 1000 + 150(n-1)$

Now that we're refreshed

Pick Up the Warm Up

1

With each function: underline if its a linear function, circle if its an exponential function and leave blank if it is neither

$f(x) = 5(2)^x$ $f(x) = 3x^2$ $f(x) = 3x - 2$ $f(x) = 3\left(\frac{1}{4}\right)^x$

$f(x) = 3 + 5(x-1)$ $f(x) = 1.2^x$ $f(x) = 3(1)^x$ $y = 7x$

$y = 1000(.6)^x$

$\frac{2}{3}$

1.7

$f(x) =$

2

A bacteria decays at a rate of 30% per hour. If there are 2000 bacteria to start with:

a) Write an equation that will represent the number after *t* hours.

$y = 2000(.7)^t$

$y = a \cdot b^x$

b) How much will be left in 8 hours ?

$2000(.7)^8 = 115.3$ bacteria

c) Approximately, when will there be only 2 bacteria left ?

$y = 2000(.7)^t$

$2 = 2000(.7)^t$

$y = 2$ $y = 2000(.7)^t$

So when the time is about 19.4 hours there will be about 2 bacteria wait for instructions

Percent Growth

(3) Force the sequence to grow by $\underline{14\%}$ multiplier $\underline{1.14}$

120, __, __, __, ...

$100\% + 14\% = 114\%$

1.14

$\cancel{.14}$

$\cancel{.86}$

1.14

$\cancel{.114}$

114

$y = ab^x$

$y = 105.26(1.14)^x$

$y = \frac{2000}{19}(1.14)^x$

(4) Force 10,000 to decrease by $\underline{2.5\%}$ multiplier $\underline{.975}$

1025.641026

1000 (1), 975, 950.625 (3), ≈926.86

$100\% - 2.5\%$

97.5%

$.975$

$y = \frac{40000}{39}(.975)^x$

(5) Start with 1000 ANTS. Write a formula so it grows by 8.1 %   multiplier 1.081

$100\% + 8.1\% = 108.1\%$

formula $y = 1000(1.081)^x$

How many weeks would it take to reach 80,000 ants?

$80000 = 1000(1.081)^x$

Solve using graph. calcul.

$x \approx 56.3$ weeks

$y = ab^x$

#weeks

Go to your notes

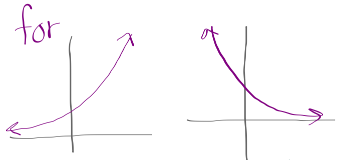
Summary

Exponential Functions ← cousins of geometric sequences

Summary

Exponential Functions

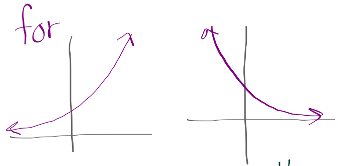
for



for asymptote on the x-axis

Summary Exponential Functions

for



for asymptote on the x-axis

$$y = ab^x$$

Summary Exponential Functions

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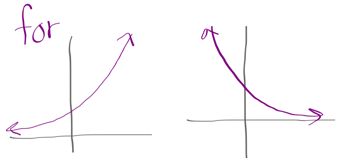


for asymptote on the x-axis

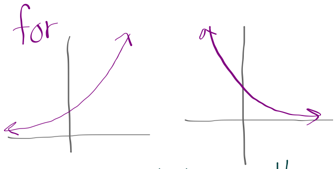
$$y = ab^x$$

beginning value when $x=0$

y-intercept of graph

Summary Exponential Functions

for



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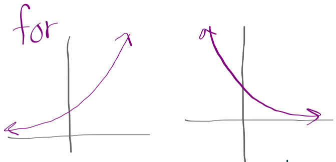

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$$y = ab^x$$

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y-intercept of graph

multiplier (growth factor)

Summary

Exponential Functions

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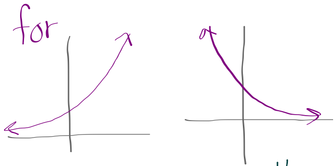


for asymptote on the x-axis

$$y = ab^x$$

beginning value when $x=0$

y-intercept of graph

multiplier (growth factor)

$b = 1 + r$

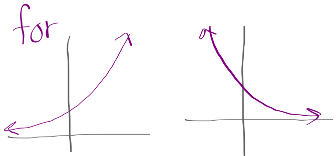
% growth or decay as a decimal

$1 - r$

Summary

Exponential Functions

for



x can be any value

for asymptote on the x-axis

$$y = ab^x$$

beginning value when $x=0$

y-intercept of graph

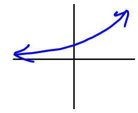
multiplier (growth factor)

$b = 1 + r$

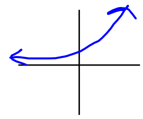
% growth or decay as a decimal

$1 - r$

$y = 1(2)^x$

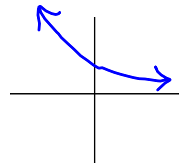


$y = 1(1.23)^x$

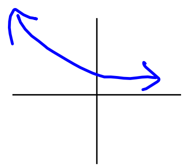


Exponential Growth when $b > 1$

$y = 1(0.35)^x$



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

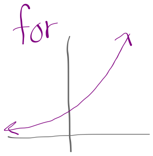


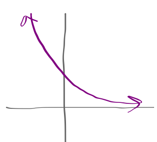
Exponential Decay

$0 < b < 1$

Summary Exponential Functions

for





for asymptote on the x-axis

$y = ab^x$

x can be any value

$b > 1$ growth

$0 < b < 1$ decay

multiplier (growth factor

$b = 1 + r$

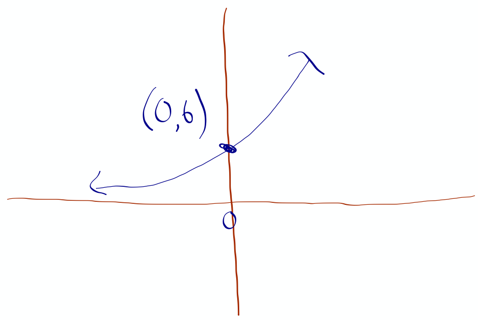
% growth or decay as a decimal!

beginning value when $x = 0$

y-intercept of graph

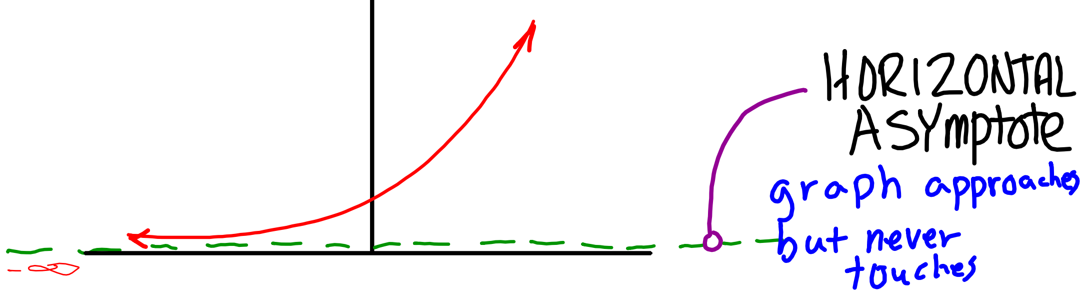
How many of you could sketch (w/o GDC)

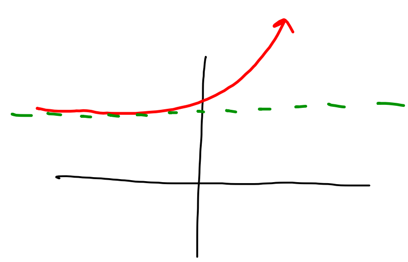
$y = 6(2.7)^x$?



$5^0 =$

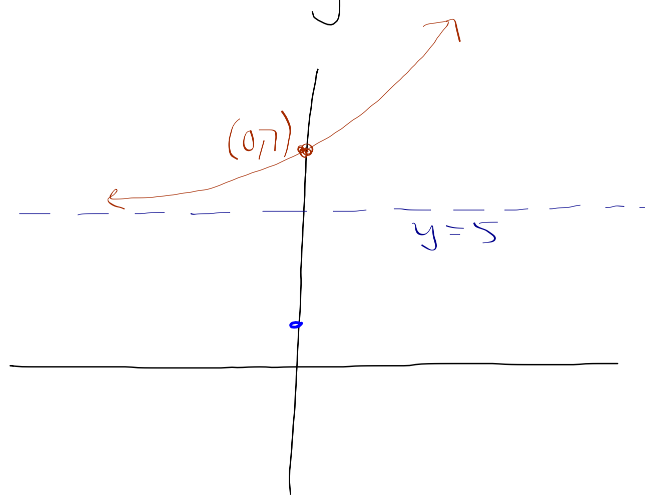
$1.76^0 =$



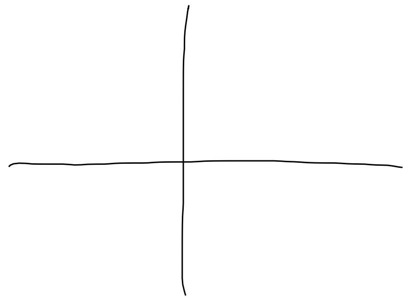


Turn All GDC's upside down

Sketch $y = 2(3)^x + 5$



☆ Sketch $y = 8\left(\frac{2}{3}\right)^x - 4$



Find the y-intercept analytically.

$y = 3(2)^x$

Graph and find the y-intercept.

3

option I 100, 11% growth

option II 2000, 4% growth

How many weeks before option I overtakes option II

BB

what if exponents are negative ????

(a handout)

What if there were negative exponents?

$\left(\frac{3}{5}\right)^{-1} = \left(\frac{5}{3}\right)^{1} = \frac{5}{3}$

$5^{-1} = \left(\frac{5}{1}\right)^{-1} = \frac{1}{5}$

$\left(\frac{a}{de}\right)^{-1} = \left(\frac{de}{a}\right)^{1} = \frac{de}{a}$

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

$$\left(\frac{1}{4}\right)^{-2} = \left(\frac{4}{1}\right)^2 = \frac{4^2}{1} = 16$$

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

$$\left(\frac{3x}{y}\right)^{-2} = \left(\frac{y}{3x}\right)^2 = \frac{y^2}{9x^2}$$

$$\frac{1}{3^{-1}} =$$

$$\frac{1}{x^{-2}} = \left(\frac{1}{x}\right)^{-2} = \left(\frac{x}{1}\right)^2 = x^2$$

$$\frac{3}{e^{-2}} = 3 \cdot e^2$$

$$a^4 \cdot b^{-2} \cdot a^3 \bullet b^4 = a^4 a^3 \bullet b^{-2} \cdot b^4 = a^7 \bullet b^2$$

$$x^4 \cdot y^{-2} \cdot x^{-5} \cdot y^2 = x^{-1} y^4 = \frac{y^4}{x^1} = \boxed{\frac{y^4}{x}}$$

$$\frac{n^8}{n^{-2}} = n^8 \cdot n^2 = n^{10}$$

$$\frac{5x^{-3}}{x^6} = \frac{5}{x^6 x^3} = \boxed{\frac{5}{x^9}}$$

Each pair should pick up and work on one handout.

Exponent Review

Boot camp

Manipulating Powers

Exponent LAWS (add to your notes)

1) $(a^x)^y = a^{xy}$
2) $a^x \cdot a^y = a^{x+y}$
3) $\frac{a^x}{a^y} = a^{x-y}$
4) $(ab)^x = a^x b^x$
5) $\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$
6) $a^{-x} = \frac{1}{a^x}$
7) $\frac{1}{a^{-x}} = a^x$

Handout

Manipulating Powers

Exponent LAWS (add to your notes)

1) $(a^x)^y = a^{xy}$
2) $a^x \cdot a^y = a^{x+y}$
3) $\frac{a^x}{a^y} = a^{x-y}$
4) $(ab)^x = a^x b^x$
5) $\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$
6) $a^{-x} = \frac{1}{a^x}$
7) $\frac{1}{a^{-x}} = a^x$

Simplify each expression.

Example: $(x^2)^4 = x^{2 \cdot 4} = x^8$

1. $x^4 \cdot x^2$

use the 2nd law

2. $\frac{x^8}{x^6}$

3. $(x^2 y)^3$

4. $\left(\frac{x}{y^3}\right)^5$

5. y^{-15}

6. $\frac{1}{x^{-15}}$

7. $\frac{a^6}{a^9}$

8. $(2c^2)^3$

9. $\dfrac{n^4 \cdot n^6}{n^8 \cdot n^2}$

10. $4a^5 \cdot 3a^3$

11. $\left(\dfrac{v}{3}\right)^4 \cdot \left(\dfrac{5}{v}\right)^2$

12. $(x^{-2})^2$

13. $\left(\dfrac{2}{x}\right)^{-1}$

Assignment:

is in Appendix A in the back of your book.

A.....10, 23, 88, 91, 92, 116, 119, 120

Summary SEQUENCES - Explicit Formulas

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Arithmetic	Geometric

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$t_n = t_1 + d(n-1)$	

Summary SEQUENCES - Explicit Formulas

Arithmetic	Geometric
first term, common diff	
$t_n = t_1 + d(n-1)$	

Summary SEQUENCES - Explicit Formulas

Arithmetic

Geometric

first term, common diff

$t_n = t_1 + d(n-1)$

or

$t_n = t_0 + dn$

Summary SEQUENCES - Explicit Formulas

Arithmetic	Geometric
first term, common diff $t_n = t_1 + d(n-1)$ or $t_n = t_0 + dn$ 0 term, comm diff.	

Summary SEQUENCES - Explicit Formulas

Arithmetic	Geometric
first term, common diff $t_n = t_1 + d(n-1)$ or term# $t_n = t_0 + dn$ 0 term, comm diff.	

Summary SEQUENCES - Explicit Formulas

Arithmetic

first term, common diff

$$t_n = t_1 + d(n-1)$$

term#

or

$$t_n = t_0 + dn$$

0 term, comm diff.

Geometric

$$t_n = t_1 (r)^{n-1}$$

or

$$t_n = t_0 (r)^n$$

Summary SEQUENCES - Explicit Formulas

Arithmetic

first term, common diff

$$t_n = t_1 + d(n-1)$$

term#

or

$$t_n = t_0 + dn$$

0 term, comm diff.

Geometric

first term

$$t_n = t_1 (r)^{n-1}$$

common ratio

or

$$t_n = t_0 (r)^n$$

0 term

Summary SEQUENCES - Explicit Formulas

Arithmetic

first term, common diff

$$t_n = t_1 + d(n-1)$$

term #

or

$$t_n = t_0 + dn$$

0 term, comm diff.

Geometric

first term

$$t_n = t_1(r)^{n-1}$$

common ratio

or

$$t_n = t_0(r)^n$$

0 term

n can only be a whole number

4

N $\dfrac{2K^5}{K}$	O $\dfrac{6K^9}{K^9}$
R $24A^2B = 8AB(?)$	S $-56S^2A^8 = 14S^2A^4(?)$
T $A^2K^4 = (AK^2)(?)$	U $A^3K^8 = (K^7)(?)$
V $\dfrac{-18A^6K^2}{6A^3K}$	W $\dfrac{27A^2K^9}{-3AK^3}$

C $(-2A)^3$	D $(-4A)^2$
E $(A^4)^4$	G $(A^2)^3$
H $(-3A^2)^2$	I $3A(2A)^2$
L $(-4A^4)^3$	M $(5A^5)^2$

$-4A^4$	$9A^4$	6	A^3K	$-64A^2$	$16A^2$	
$3A$	A^{16}	$25A^{10}$	6	$-3A^3K$	A^{16}	
AK^2	$9A^4$	A^{16}		$-4A^4$	A^3K	$2K^4$
$-4A^4$	$-8A^3$	$3A$	A^{16}	A^{16}	$2K^4$	
$-9AK^6$	$9A^4$	$12A^3$	$-64A^{12}$	A^{16}		
$16A^2$	$3A$	$12A^3$	$-3A^3K$	$12A^3$	$2K^4$	A^6