Back to yesterday's notes

One of the skills you acquired in Algebra 1 CC was the ability to write equations of exponential functions if you had information about the starting value and the base(growth constant). Determine the function of the form $f(x) = a \bullet b^x$ with the information in the table below. Before we start, what do a and b represent in this function.

a= initial value

b= growth or decay rate

You can use your calculator to generate the equation for the data. You will need to enter your data into a list by using STAT → EDIT and then use the STAT → CALC → ExpReg to generate the actual equation.

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

a= 5

b= 3

f(x)= $5(3)^x$

L1

L2

x	0	1	2	3
f(x)	5	15	45	135

Jan 30-6:18 PM

A runner is using a nine-week training program app to prepare for a "fun run." The table below represents the amount of the program completed, A, and the distance covered in a session, D, in miles.

amt of prog.

A	4/9	5/9	6/9	8/9	1
D	2	2	2.25	3	3.25

distance

Based on the data, write an exponential regression equation, rounded to the nearest thousandth, to model the distance the runner is able to complete in a session as she continues through the nine-week program.

Stat Calc ExpReg

$y = ab^x$

$a = 1.223034 = 1.223$

$b = 2.652$

$y = 1.223(2.652)^x$

Jan 28-4:58 PM

HW 9-6

Try or check #6 on HW.
Try the warmup in our notes.
Quiz on Day 5: Solve & CHECK a radical equation.

Questions 1 and 2: See next slide for solutions

3. 2

4. Reflection over the x-axis, Right 3, Down 2

5. Left 3, Up 10

6. $y = (27.2025)(1.1509)^x$

7. 6. $x^{\frac{7}{4}}$

8. 7. $11^{\frac{3}{7}}$

9. 8. $27x^6$

10. 9. $a^{\frac{1}{4}}$

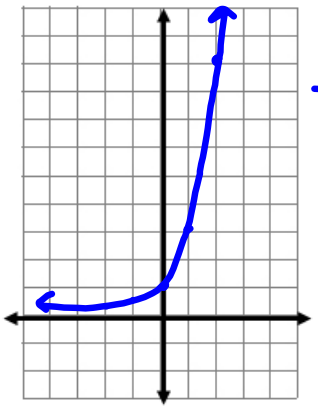
11. 10. 3

Feb 1-4:51 PM

Name_____ Alg 2 HW9-6

1. Graph $y = 3^x$

Show a table of values.



x	y
-2	1/9
-1	1/3
0	1
1	3
2	9

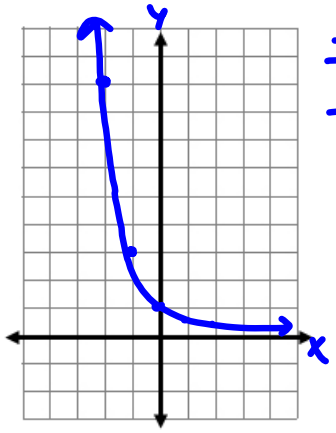
Exponential growth or decay?(Circle One)

Domain $\{x \mid x \in \mathbb{R}\}$

Range $\{y \mid y > 0\}$

2. Graph $y = 3^{-x}$

Show a table of values.



x	y
-2	9
-1	3
0	1
1	1/3
2	1/9

Exponential growth or decay?(Circle One)

Domain $\{x \mid x \in \mathbb{R}\}$

Range $\{y \mid y > 0\}$

Nov 24-11:13 AM

3. Which statement is always true about the graph of $f(x) = \left(\frac{1}{8}\right)^x$?

1. The graph is always increasing.
2. The graph is always decreasing.
3. The graph passes through the point (1, 0).
4. The graph has an asymptote, x = 0.

State the transformations of the following functions.

4. $y = -3^{x-3} - 2$

① reflect x-axis ③ down 2
② right 3

5. $y = 2^{x+3} + 10$

① left 3
② up 10

Jan 30-3:02 PM

6. A population of single celled-organisms was grown in a petri dish over a period of 16 hours. The number of organisms at a given time is recorded in the table below. Determine the exponential regression equation model, rounding all values to the ***nearest ten-thousandth.***

Time, hrs (x)	0	2	4	6	8	10	12	16
Number of Organisms (y)	25	36	52	68	85	104	142	260

$y = (27.2025)(1.1509)^x$

Simplify. Express your solution with rational exponents.

6. $x^{\frac{1}{4}} \cdot x^{\frac{3}{2}} = x^{1/4} \cdot x^{6/4} = x^{7/4}$

7. $\frac{11^{\frac{5}{7}}}{11^{\frac{2}{7}}} = 11^{5/7 - 2/7} = 11^{3/7}$

8. $(9x^4)^{\frac{3}{2}} = 9^{3/2} x^{12/2} = (\sqrt{9})^3 \cdot x^6 = 27x^6$

9. $\frac{a^{\frac{1}{3}} \cdot \sqrt[6]{a}}{a^{\frac{1}{4}}} = \frac{a^{1/3} \cdot a^{1/6}}{a^{1/4}} = \frac{a^{4/12} \cdot a^{2/12}}{a^{3/12}} = \frac{a^{6/12}}{a^{3/12}} = a^{3/12} = a^{1/4}$

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10. The value(s) of x that satisfy $\sqrt{x^2 - 4x - 5} = 2x - 10$

1. {5}
2. {7}
3. {5,7}
4. {3,5,7}

$x^2-4x-5=(2x-10)^2$

$x^2-4x-5=4x^2-40x+100$

$-x^2\ +4x\ +5 \quad -x^2\ +4x\ +5$

$\frac{3x^2}{3}-\frac{36x}{3}+\frac{105}{3}=\frac{0}{3}$

$x^2-12x+35=0$

$(x-7)(x-5)=0$

$x-7=0 \quad x-5=0$

$x=7 \quad x=5$

Check $x=7$

$\sqrt{49-28-5}=14-10$

$\sqrt{16}=4$

$4=4$ ✓

$x=5$

$\sqrt{25-20-5}=10-10$

$\sqrt{0}=0$

$0=0$ ✓

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QUIZ

Turn in the quiz when you're done and do the warm-up at the top of our notes if you haven't.

Feb 5-9:20 PM

Word Problems using Exponential Growth and Decay Unit 9 Day 7

Warm-up

Given the function $f(x) = 5(x+4)^{\frac{3}{2}}$, which of the following represents its y-intercept?

(1) 40 (2) 20 (3) 4 (4) 30

set $x=0$

$f(0) = 5(0+4)^{3/2} = 5(4)^{3/2} = 5(\sqrt{4})^3 = 5(2^3) = 5(8)$

$= 40$

Word Problems Using Exponential Growth and Decay

Jan 30-6:20 PM

Word Problems Involving Exponential Functions:

$A(t) = a(1 \pm r)^t$ think: end = start $(1 \pm r)^{time}$

where:

2% → .02

A(t) → ending amount r → rate as a decimal

a → initial amount t → time usually in years

$(1 \pm r)$ → Growth / Decay Factor $1+r$ / $1-r$

For 1 & 2, given the equation, determine

a. increasing or decreasing $b>1$ $0<b<1$

b. the initial amount a

c. the rate of change $= r$ (difference from 1)

d. the growth/decay factor $1+r$ or $1-r$

e. Find P(4) to the nearest ~~hundredth~~ tenth $1-r$

1. $P(t) = 6000(.8)^t$

a) decreasing $(.8<1)$

b) 6000

c) $r = .2$

d) .8

e) $P(4) = 6000(.8)^4 = 2457.6$

2. $P(t) = 10,000(1.25)^t$

a) increasing $(1.25>1)$

b) 10,000

c) $r = .25$

d) 1.25

e) $P(4) = 10,000(1.25)^4 = 24,414.1$

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3. A certain car depreciates about 15% each year. decay, $r = .15$

a. Write a function to model the depreciation in value for a car valued at $25,000.

b. Suppose the car was worth $25,000 in 2013. How much will the car be worth in

a) 2018 $A(t) = a(1-r)^t$ $W(t) = 25,000(1-.15)^t$

$W(t) = 25,000(.85)^t$

b) $t = 5$ $W(5) = 25,000(.85)^5 = \$11,092.63$

4. Weeds are growing in Tony's front lawn at a rate of 5% per week. The lawn is 7500 square feet. If there are 40 square feet covered with weeds now, how many square feet, to the nearest integer, of the lawn will be covered with weeds after 7 weeks? **Hint: Write the function first and then evaluate for 7 weeks.**

$r = .05$

a) $W(t) = 40(1+.05)^t$

$W(t) = 40(1.05)^t$

b) $W(7) = 40(1.05)^7 = 56.28 \approx 56$ square feet.

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5. In New York State, the minimum wage has grown exponentially. In 1966, the minimum wage was $1.25 an hour and in 2015, it was $8.75. Algebraically determine the rate of growth to the *nearest percent*. Find r

$A(t) = a(1+r)^t$

$8.75 = 1.25(1+r)^{49}$

$\frac{8.75}{1.25} = (1+r)^{49}$

$7 = (1+r)^{49}$

$1.04 = 1+r$

$r = .040S$ $\approx 4\%$

$t = 2015 - 1966 = 49$

$\sqrt[49]{7} = \sqrt[49]{(1+r)^{49}}$

6. Apple stock was worth $10 a share in 1995. Due to Apple's success, the stock was worth $90 a share in 2017. Assuming exponential growth, approximate the annual growth rate, to the nearest tenth of a percent.

The annual growth rate is approximately 10.5%.

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