

Exponential Functions Quiz 2 Study Guide

Quiz Monday. KEY TO THIS STUDY GUIDE IS ON MY WEBSITE!!!

Need to Know:

- How to write and evaluate an exponential growth or decay Function
- How to find the exponential growth or decay rate
- Linear vs Exponential Models
- How to write a compound interest formula and calculate compound interest

How to Write and Evaluate an Exponential Growth or Decay Function

1. Cellphone usage grew about 26% each year from 1995 to 1999.
The number of people using cellphones in 1995 was 34 million.

a. Write a function to describe the situation.

$$C(t) = 34,000,000 \cdot 1.26^t$$

b. How many people were using cellphones in 1999?

$$C(4) = 34,000,000 \cdot 1.26^4 \approx 85,696,108$$

2. Ms. England drives a Tahoe. She bought her car for \$10,750 (let's pretend). It depreciates at a rate of 10.7% per year.

$$100\% - 10.7\% = 89.3\% = 0.893$$

a. Write a function to describe the situation.

$$C(t) = 10750 \cdot 0.893^t$$

b. How much will it be worth ten years from now?

$$C(10) = 10750 \cdot 0.893^{10} \approx \$3466.75$$

3. The value of an antique car is modeled by the equation below. Describe what each quantity represents in context.

$$c(t) = 62,000(1.32)^t$$

• $c(t)$ is the value of the car after t years

• \$62,000: original value of car

• 1.32 means the car gains 32% value per year

• t is the number of years

4. Bargain Hunt is a store that sells goods at discounted rates. Every month an item has been in the store the price drops by 15%. If Merna sees a TV she would like to buy that begins at a price of \$350, how many months will she have to wait for the price to drop below \$260? Show work.

$$1 \text{ month: } 350 \cdot 0.85^1 \approx \$297.50$$

$$2 \text{ months: } 350 \cdot 0.85^2 \approx \$252.88$$

2 months

5. Make up your own exponential growth problem and solve it.

Sample: Fido had 50 bones. He increased his bone collection by 12% each day. How many bones did he have after 20 days?

$$50 \cdot 1.12^{20} \approx 482 \text{ bones}$$

6. Make up your own exponential decay problem and solve it.

Sample: Fido had 50 bones. He lost 12% of his bones each day. How many bones did he have after 4 days?

$$50 \cdot 0.88^4 \approx 30 \text{ bones}$$

7. A major technology company, ExpoGrow, is growing incredibly fast. They recently released a report that said so far, the number of employees, y , could be found with the equation $y = 2(3)^x$ where x represents the years since the company was founded. How many people founded the company? How do you know? How can the growth of the company be described? Be as specific as possible.

2 people founded the company. (If you plug in 0 years for x , you get $y=2$)
The number of employees triples each year.

8. As a part of a major scandal, it was discovered that many statements made in ExpoGrow's report were false. If the company actually had 5 founders and doubles in size each year, what rule should it have printed in its report?

$$y = 5(2)^x$$

9. A computer virus is affecting a school's computers in such a way that each day, a certain portion of virus-free computers becomes infected. The number of virus-free computers is recorded below. What portion of virus-free computers becomes infected each day? How many computers will be virus-free on day 4? Justify your answer.

Day	Virus-Free Computers
0	27
1	18
2	12
3	8

$$8 \cdot \frac{2}{3} = \frac{16}{3} = 5\frac{1}{3}$$

$\frac{2}{3}$ of the computers remain virus-free per day

so $\frac{1}{3}$ of the computers are infected each day

$5\frac{1}{3}$ (so basically just 5) computers are virus-free on day 4.

How to Find the Exponential Growth or Decay Rate

10. Write an exponential growth or decay function for the chart.

Then fill in the missing table values.

$$y = 1.8 \cdot 3.2^x$$

x	y
0	1.8
1	5.76
2	18.432
3	58.9824
4	188.74368

$$5.76 \div 1.8 = 3.2$$

$$18.432 \div 5.76 = 3.2$$

$\downarrow \times 3.2$

$\downarrow \times 3.2$

$\downarrow \times 3.2$

$\downarrow \times 3.2$

vs Exponential Model

Stock A is initially worth \$1300 and loses \$80 per month. Stock B is initially worth \$400 and gains 9.5% each month. When will Stock B be worth more than Stock A?

STOCK A: $y = 1300 - 80x$

STOCK B: $y = 400 \cdot 1.095^x$

After 7 months

5 months:	$1300 - 80(5) = 900$
6 months:	820
7 months:	740

5 months:	$400 \cdot 1.095^5 \approx \629.70
6 months:	$\approx \$689.52$
7 months:	$\approx \$759.02 \leftarrow \text{more!}$

How to Write a Compound Interest Formula and Calculate Compound Interest

12. Stephen puts \$10,000 in a savings account. The interest rate for his bank is 0.8% compounded quarterly
- a. Write a function to model this situation.

$0.8\% \rightarrow 0.008$ $n=4$

~~$f(t) = 10,000(1.008)^{4t}$~~
 $f(t) = 10,000(1 + \frac{0.008}{4})^{4t}$ or $f(t) = 10,000(1.002)^{4t}$

- b. How much will he have in his account in five years?

$f(5) = 10,000(1.002)^{20} \approx \$10,407.69$

13. Daniel wants to put \$50,000 in the bank to gain interest for three years \rightarrow ignore

- Who Wants to be a Millionaire? Bank gives 8% interest compounded annually.
- Ke\$ha Bank gives 8% interest compounded quarterly.
- Piggy Bank gives 8% interest compounded monthly.

- a. Before you calculate anything, which bank do you think Daniel should put his money in? Why?

Piggy Bank - the more times you calculate + add interest, the better.

- b. Write an equation for each bank.

$W(x) = 50,000(1.08)^x$
 $K(x) = 50,000(1 + \frac{0.08}{4})^{4x} \rightarrow K(x) = 50,000(1.02)^{4x}$
 $P(x) = 50,000(1 + \frac{0.08}{12})^{12x} \rightarrow P(x) = 50,000(1.006)^{12x}$

- c. How much will Daniel have in each bank account after five years?

WWTBAM:	$50,000(1.08)^5$	$\approx \$73,466.40$
Ke\$ha:	$50,000(1.02)^{20}$	$\approx \$74,297.37$
Piggy:	$50,000(1 + \frac{0.08}{12})^{60}$	$\approx \$74,492.29$