

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.

$$f(t) = 34,000,000 (1.26)^t \quad t = \# \text{ of years since 1995}$$

(answer will be in millions)

b. How many people were using cellphones in 1999?

$$f(4) = 34,000,000 (1.26)^4$$

$\approx 85,696,107$ people

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.

a. Write a function to describe the situation.

$$f(t) = 10,750 (.893)^t \quad t = \# \text{ of years}$$

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

$$f(10) = 10,750 (.893)^{10}$$

$\$3466.75$

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

$$c(t) = 62,000(1.32)^t \quad t = \text{time (in number of years) probably}$$

\$62,000 is the initial amount the car was worth.

The car is increasing in value by 32% per year.

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.

$$y = 350 (.85)^t$$

$t = \text{time in months}$

She will have to wait 2 months

$$y = 350 (.85)^3 \rightarrow 252.88$$

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

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

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 because at "time 0"
 $y = 2(3)^0 \rightarrow y = 2 \cdot 1$ $y = 2 \rightarrow$ # of people
 The company's number of employees is tripling each year because
 we are multiplying by 3 each time x goes up by 1.

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 |

4 $5\frac{1}{3}$

$\frac{1}{3}$ of the computers become infected each day because $\frac{2}{3}$ of the computers remain virus-free the next day.
 5 computers are virus free on day 4 (part of the 6th computer is already infected)

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.

$y = 1.8(3.2)^x$

| x | Y |
|---|-----------|
| 0 | 1.8 |
| 1 | 5.76 |
| 2 | 18.432 |
| 3 | 58.9824 |
| 4 | 188.74368 |

Linear vs Exponential Model

11. 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?

| | | | |
|----------------------------|-----------------------------|--------------------|----------------------------|
| | <u>Stock A</u> | <u>Stock B</u> | |
| $x = \# \text{ of months}$ | $y = 1300 - 80x$ | $y = 400(1.095)^x$ | $x = \# \text{ of months}$ |
| | Stock A: $y = 1300 - 80(7)$ | $y = 400(1.095)^7$ | |
| | $y = 740$ | $y = 755.02$ | |

After 7 months → use guess and check until you get the right answer - you could also make a chart for both

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.

$$f(t) = 10,000 \left(1 + \frac{.008}{4}\right)^{4t}$$

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

$$f(5) = 10,000 \left(1 + \frac{.008}{4}\right)^{5 \cdot 4}$$

\$10,407.69

13. Daniel wants to put \$50,000 in the bank to gain interest for ^{five} ~~three~~ years.

- 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?

Daniel should put his money in Piggy Bank because it compounds more often.

b. Write an equation for each bank.

| | |
|-------------------------------|---|
| Who wants to be a Millionaire | $f(t) = 50,000 \left(1 + \frac{.08}{1}\right)^t$ |
| Ke\$ha Bank | $f(t) = 50,000 \left(1 + \frac{.08}{4}\right)^{4t}$ |
| Piggy Bank | $f(t) = 50,000 \left(1 + \frac{.08}{12}\right)^{12t}$ |

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

| | |
|--------------------------------|--------------------|
| Who Wants to be a Millionaire? | \$ 73466.40 |
| Ke\$ha Bank | \$ 74297.37 |
| <u>Piggy Bank</u> | <u>\$ 74492.29</u> |