Key

Objective: Be able to interpret exponential functions written different ways.

Compound Interest

1. $20,000 at a rate of 10% compounded monthly.

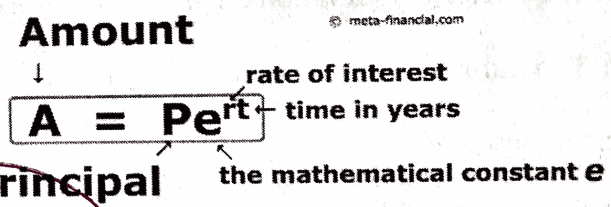
write a function with $12t$ as your exponent.	write a function with t as your exponent.
$f(t) = 20{,}000\left(1+\frac{.10}{12}\right)^{12t}$ $f(t) = 20{,}000\left(1.008\bar{3}\right)^{12t}$ What does this function highlight? every month how much interest	$f(t) = 20{,}000\left[1.008\bar{3}^{12}\right]^{t}$ $f(t) = 20{,}000\left(1.1047\right)^{t}$ What does this function highlight? per year how much interest

Calculate how much you have after 20 years: $146,561.47

Continuously Compounded Interest is a great thing when you are earning it! **Continuously compounded interest** means that your principal is constantly earning interest and the interest keeps earning on the interest earned!

2. $20,000 at a rate of 10% compounded continuously

$A = 20{,}000\,e^{.10t}$



Calculate how much you have after 20 years:

$A = 20{,}000\,e^{2}$ $147,781.12

3. Three physicists describe the amount of a radioactive substance, Q in grams, left after t years:

Physicist 1: $Q = 300\left(\frac{1}{2}\right)^{\frac{t}{12}}$ Physicist 2: $Q = 300(0.9439)^{t}$ Physicist 3: $Q = 252.290(0.9439)^{t-3}$

a. WITHOUT graphing, show that all three of these are equivalent.

$Q = 300\left(\frac{1}{2}^{\frac{1}{12}}\right)^{t}$

$Q = 300\,(.9439)^{t}$

$Q = 252.290(.9439^{t})(.9439)^{-3}$

$Q = 300\,(.9439)^{t}$

b. Which of the expressions highlights what the amount of radioactivity is after 3 years?

Physicist 3 → if you plug in 3 for t you get 252.290

c. Which expression highlights the half-life (the time taken for the radioactivity of a specified isotope to fall to half its original value) of the radioactive substance? Why? What is the half-life? → 12 years

Physicist 1 because $\frac{1}{2}$ is the base (what you are multiplying by)

d. Which expression highlights the decay rate each year? Why? What is the percent decay each year?

Physicist 2 because t is the exponent → 5.61 %

4. The relationship between the elapsed time t, in seconds, and the number of bacteria, $N(t)$, in the petri dish is modeled by the following function: $N(t) = 50{,}000(0.5)^{\frac{t}{4.3}}$

The Petri dish loses 50% of bacteria every 4.3 seconds.

5. The relationship between the elapsed time, t, in minutes, since Kiptyn yawned, and the number of people in the crowd, $P(t)$, who yawned is modeled by the following function: $P(t) = 5(4)^{\frac{t}{10}}$

The number of people who yawned quadruples every 10 minutes.

6. The function $f(t) = 4(2)^{2t}$ represents the population of bacteria in a petri dish, and $f(t)$ is the expected population t hours from now. Mark each statement as true or false.

a. The bacteria population quadruples every 2 hours False - every 1 hour

b. The number of bacteria at the beginning (t=0) is 16 False $4.(2)^0 = 4$

c. The number of bacteria after fifteen minutes is 8 False $4(2)^{\frac{1}{2}} = 4\sqrt{2}$

d. The function could be written as $f(t) = 16^{2t}$ False

e. The function could be written as $f(t) = 4^{t+1}$ True

$4(2^2)^t$

$4(4)^t$

4^{t+1}

7. The funciton $f(t) = 50{,}000(1.5)^{\frac{t}{20}}$ represents the population of a town that is growing, and $f(t)$ is the expected population t years from now. Mark each statement as true or false.

a. The town's population is growing by 50% every 10 years. False - every 20 years

b. The town's population will be 100,000 after 40 years. False - $50{,}000(1.5)^2 > 100{,}000$

c. The function could be written as $f(t) = 50{,}000\left(1.5^{\frac{1}{20}}\right)^t$ True

Exponential Functions HW Day 6

Objective: Be able to write an exponential function and find a value from it.

1 a. In 1995, the population of a town was 33,500. It is decreasing at a rate of 2.5% per decade. Write the function, $f(n)$, that expresses the population of the town after n decades.

b. What is the expected population of the town in the year 2025?

2. a. Starting with 25 members, a club doubled its membership every year. Write the function $f(n)$ that expresses the number of members in the club after n years.

b. What is the average rate of change for the first 6 years? What does this mean in context?

Objective: Be able to write an exponential equation for a table.

3a.

x	0	1	2	3
$f(x)$	6	18	54	162

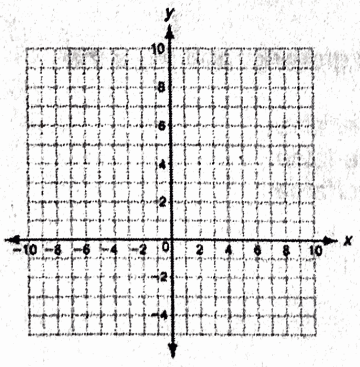
b.

x	0	1	2	3
$f(x)$	36	27	20.25	15.1875

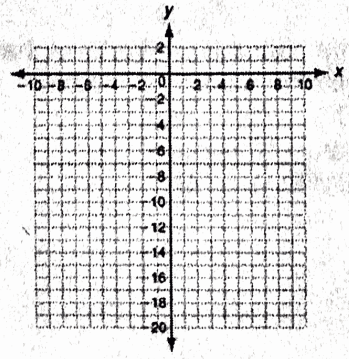
Objective: Be able to graph exponential function transformations. (and know domain, range, end behavior, and asymptotes)

Remember: if you need to- make a chart off to the side.

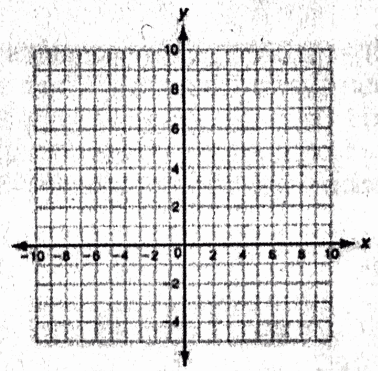
4. $y = 5(2)^{x-1}$



5. $y = -2(3)^x$



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



Objective: Be able to write compound interest formulas two ways.

7. The principal amount, $4200, earns 3.6% interest compounded quarterly.

write a function with $4t$ as your exponent.	write a function with t as your exponent.

Objective: Be able to interpret exponential functions written different ways.

7. The function $f(t) = 4(2)^{2t}$ represents the population of bacteria in a petri dish, and f(t) is the expected population t hours from now. Which statements are true/false?

a. The bacteria population doubles every 2 hours — true/false
b. The number of bacteria at the beginning (t=0) is 8 — true/false
c. The number of bacteria after 30 minutes is 8 — true/false
d. The function could be written as $f(t)=16(2)^t$ — true/false
e. The function could be written as $f(t)=(2)^{2t+2}$ — true/false

8. The function $f(t) = 50{,}000\ (1.5)^{t/5}$ represents the population of a town that is growing, and f(t) is the expected population t years from now. Which statements are true/false?

a. The town's population is growing by 50% every 5 years — true/false
b. The town's population will be 100,000 after 10 years — true/false
c. The function could be written as $f(t)=50{,}000\ (1.5^{1/5})^t$ — true/false