Pre Calc Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

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 WS Assessment

Target 7

Exponential and logarithm

* Exponential Functions
* Applying Exponential Functions
* Logarithmic Functions
* Properties and Graphs of Logarithms
* Evaluating and Applying Logarithms
* Solving Exponential and Logarithmic Equations
* Applying Exponents and Logarithms

HW 7 Exponential and Logarithm [www.deltamath.com](http://www.deltamath.com)

Forms of exponential functions including the following:

f(x) = abx or f(x) = aekt (real life model of growing or decaying)

 $P\left(t\right)=P\_{0}(1+\frac{r}{k})^{kt}$ $A\left(t\right)=Pe^{rt}$ Compound interest – and continuously grow

Fill in the table and sketch the graph of the following

|  |  |  |  |
| --- | --- | --- | --- |
| f(x) = 3x | f(x) = 3-x | f(x) = (1/3)x | f(x) = (1/3)-x |
|

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| --- | --- |
| x | f(x) |
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| x | f(x) |
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| x | f(x) |
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| x | f(x) |
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Write your conclusion about the value of the base b (compare with 1), the power x and its grow/decay property.

 *b > 1 positive power b > 1 negative power b < 1 positive power b < 1 negative power*

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If you invest $1,000 in an account paying 4% interest, compounded quarterly, how much money will you have after 3 years?

Caesium-137 is a radioactive element used in medical applications. It has a half-life of about 30 years. Suppose a laboratory has 10 grams of caesium-137. If they don’t use it, how much will still be caesium-137 in 60 years? [Half life decay formula $R=A(.5)^{\frac{t}{t\_{h}}}$ ]

 A = 10 t = 60 th = 30

A biologist is researching a newly-discovered species of bacteria. At time*t* = 0 hours, he puts one hundred bacteria into what he has determined to be a favorable growth medium. Six hours later, he measures 450 bacteria. Assuming exponential growth, what is the growth rate "r" for the bacteria?

About the natural number e

Say you invest $1 dollar in the bank with a rate of 100% for 1 year. Find the amount you get if it compound interest is yearly, quarterly, monthly, daily and more. $P\left(t\right)=P\_{0}(1+\frac{r}{k})^{kt}$

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| k = 1  | k = 4 | k = 12 | k = 365  | k = 1000 | k = 104 | k = 105 |
|  |  |  |  |  |  |  |

You have just found the number e $e=(1+\frac{1}{k})^{k}$ when k goes to infinity

Sketch on the same graph f(x) = ex and g(x) = ln(x). What do you notice?

For each of the following pairs of functions, state whether the graphs are related by a reflection over the x-axis, y-axis, diagonal line y = x; y = -x or none of these



 A population of 800 beetles is growing each month at a rate of 5%

1. How many beetles will be there in 8 months
2. How long it take for the population grow to 2000 beetles?
3. What would be a grow rate to grow to 2000 beetles in 8 months only
4. What would be the starting population to grow to 2000 beetles if grow rate is 5% in 8 month?

Solve exponential and logarithm equations

ln(x) + ln(x + 2) = ln (x + 6) 6(52x – 9 ) = 24

log3 (2x – 7) = 2 5e7x – 4 = 30

e2x – 2ex – 15 = 0 log 2 (x + 35) – log 2 (x) = 3 .

log3(5 – x) + log3(3 – x) = log3(19 – 5x)   log6(x – 11) = 2 – log6(x – 6).

(ln x)2 = ln(x4) 2 ln(x) – ln(x + 2) = 0 .

e2x – 4ex + 3 = 0 log3(x + 5) – log3(x – 7) = 2

ln(x – 3) + ln(x + 1) = ln(x + 7) 3(52x + 1) = 18(25x – 3)

Logistic Function $f\left(x\right)=\frac{c}{1+a(b)^{x}}$ or $f\left(x\right)=\frac{c}{1+a(e)^{-kx}}$ c is the limit to growth

Solve for x $32=\frac{128}{1+7(0.844)^{x}}$

A colony of bacteria *B dendroides* is growing in a petri dish. The colony’s area A can be modeled by $A=\frac{49.9}{1+134(e)^{-196t}}$ where t is the lapsed time in days. Graph the function and describe what it tells you about the growth of the bacteria colony.

Sketch a logistic graph that has an initial value 5 passes through the point (1, 8) and has a limit to growth of 13. Then find the equation that fits your graph.

You planted a sunflower seedling and kept track of its height h over time t. Find a model that gives h as a function of t. Stat plot and graph equation. Show me for stamp

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| t | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| h | 18 | 33 | 56 | 90 | 130 | 170 | 203 | 225 | 239 | 247 | 251 |

Write the equation here h(t) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Target 7 Assessment**

What is half life of carbon 14? Google it \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

In 2000, you buried 15 kg of Carbon-14 in your backyard.  Someone digs it up in the year 13,460.  How much Carbon-14 did they find? In what year this amount of carbon reduces to 1 kg?

The spread of a virus through a student population can be modeled by S $=\frac{5000}{1+2499\left(e\right)^{-0.8t}}$ where S is the total number of students infected after t days. Answer the following. Show math work

How many students “brought” virus to the school at the beginning?

How many students got infected after one week (5 school days)?

How long it takes for the whole school get infected?

Solve the equation

2(52x + 1) = 9(35x – 3)

Solve the system by graph and algebra. (challenge)

$$4^{\frac{x}{y}+\frac{y}{x}}=32$$

$$log\_{3}(x-y)+log\_{3}(x+y)=1$$