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|  **Exponential Models**  |
| Growth (also simple interest)Example baseball card bought for $150 increases in value at a rate of 3% each year. How much is the card worth in 10 years?  | The yellow bellied sapsucker has a population of 11,236 in 2006. If the population was 8,530 in 2000 and this growth rate continues, what is the rate of growth? | You have 470 dollars in a bank account that pays 12% interest yearly. How many years will it take for you to have 1000 dollars? |
| DecayYou bought a new Ford truck for $40,000 yesterday. The truck depreciates a rate of 11% each year. In how many years will the truck be $12,000? | Amy Farah Fowler bought a new car for $25,000 in 2013. The value now is $14,330. She has to pay 0.3% road use tax on the value of her car. What will her road tax be when she renews the tag in 2020?  | There are only 200 bald eagles left in America! The population is decreasing every year by a certain percent. In 20 years there will only be 3 freedom birds left. What is the percent decrease? |
| Compound InterestYour favorite Aunt gives you a quick pick. It’s your lucky day! You win $1500. You give $500 to your Aunt and put the rest in a savings account that is compounded monthly What rate do you need to get 1300 in 4 years?  | If you put $2400 in an account that pays 6.2% interest compounded quarterly. How long will it take for your money to triple? | You now have $6147 in the bank. If the money has been compounded monthly for 12 years at 4%, how much did you start with? |
| Continuous Compounding InterestYour Aunt decides to deposit the$500 you gave her into a savings account at her bank. This account pays 3.5% interest and compounds continuously. How much money will she have in this account in 8 years? | If you put the same $2400 in an account that pays 5.7% interest compounded continuously. How long will it take to triple? | What rate do you need for $5000 to become $6000 in three years, compounded continuously? |
| Finding equivalent interest ratesDiego wants to lend money to Natural Foods restaurant, which will pay 0.45% monthly interest, compounded monthly. What is the approximate equivalent annual interest rate, compounded annually?You are given the monthly which can be written . To get an equivalent yearly, we set up the equation:So the annual rate is 0.0554. | Danielle has a savings account at Valley Credit Union that pays 3.75% annual interest, compounded annually. What is the approximate equivalent monthly rate, compounded monthly? | Anjali has money to invest. One option is to lend money to a start-up software company that will pay 0.4% monthly interest, compounded monthly. What is the approximate equivalent annual interest rate, compounded annually? |

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| **Inverse Functions** |
| To find the inverse of a function, 1. Switch x and y values
2. Solve for y

Inverse notation: For logs and exponents, put the equation in the “other form”

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| y=log4(16x) | Find the inverse |
| x=log4(16y) | Switch x and y |
| 4x=16y | Put in exponent form |
| 4x/16=y | Solve for y |
| 4x-2=y | Simplify if possible |
|  |  |
| y=4x | Find the inverse |
| x=4y | Switch x and y |
| y=log4x | Put in log form |

 | Find the inverse of each function: |
| **Definition of Logarithms** |
| THE RelationshipWrite in log form Write in exponential form  | Write the following in log form: Write the following in exponential form:  |

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| **Exponential and Logarithmic Equations** |
| Logs and Exponential functions undo each other (remember they are inverse functions). If we need to undo a log function, we “exponentiate” each side. If we need to undo an exponential function we take the log of both sides.Common log Natural Log Some handy properties of logs | Solve the equation

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|  | Subtract 5 from both sides. |
|  | Switch to log form |
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|  | Use change of base to rewrite. |

Solve the equation

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|  | Put in exponential form. |
|  | Simplify right side |
|  | Divide both sides by log 4. |

 | log (2*x* + 5) = 34*x −* 5 = 12log 4*x* = 22 log (2*x* + 5) = 4ln (x+2) = 35ex+3 = 15  |
| **Graphing Exponential and Logarithmic Functions** |
| General form: f(x) parent functiong(x) transformed functiona if negative, flip vertically 0 < |a| < 1 vertical compression |a| > 1 vertical stretchh if negative, horizontal shift right if positive, horizontal shift leftk if negative, vertical shift down  if positive, vertical shift upDomain – x valuesRange – y values | What is the apparent domain and range of the function graphed below?Given: List theParent Function:Transformations:Given: List theParent Function:Transformations: | Given the graphs of f(x) and g(x) below, what is the function rule for g(x) in terms of f(x)?  |