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$\ln e^{.521t}$ $.521t(\ln e)$ $.521t(1)$ $.521t$	Bacteria Growth The number of bacteria after t hours is given by $y = 150\,e^{0.521t}$ a) What was the initial amount of bacteria present? $t=0$ $\quad y=150\,e^{.52(0)}$ $\quad y=150$ b) How many bacteria are present after 4 hours? $y=150\,e^{.521(4)}$ c) How many hours will it take until there are 400 bacteria? $400 = 150e^{.521t}$ Plug into y_2 $\quad$ plug into y_1 Find the intersection $\boxed{2nd}$ $\boxed{Trace}$ $\boxed{5}$ $\frac{400}{150} = \frac{150e^{.521t}}{150}$ $\frac{400}{150} = e^{.521t}$ $\ln\left(\frac{400}{150}\right) = \ln e^{.521t}$ $\frac{\ln\left(\frac{400}{150}\right)}{.521} = \frac{.521t}{.521}$ $\frac{\ln\left(\frac{400}{150}\right)}{.521} = t$

Determine a formula for the exponential function whose values are given

20)

x	g(x)
-2	-9.0625 ✓
-1	-7.25 ✓
0	-5.8
1	-4.64 ✓
2	-3.7123 ✓

Initial Value → 0

$y = a \cdot b^x$

$y = -5.8\, b^x$

$\frac{-4.64}{-5.8} = \frac{-5.8\, b^1}{-5.8}$

$b = .8$

$\boxed{y = -5.8(.8)^x}$

Determine a formula for the exponential function whose points are given

21) (0, 4) (5, 8.05)

Find the logistic function that satisfies the given conditions

A) Initial Value 6: Max Capacity (Limit to growth) = 30
Passing through (1, 15)

$\boxed{y = \frac{M}{1 + Ab^x}}$

$\boxed{y = \frac{30}{1 + Ab^x}}$

(0, 6)

$6 = \frac{30}{1 + Ab^0}$

$6 = \frac{30}{1 + A}$

$1 + A = \frac{30}{6}$

$1 + A = 5$

$A = 4$

(1, 15)

$15 = \frac{30}{1 + 4b^1}$

$1 + 4b = \frac{30}{15}$

$1 + 4b = 2$

$4b = 1$

$b = \frac{1}{4}$

$\boxed{y = \frac{30}{1 + 4\left(\frac{1}{4}\right)^x}}$

$\left(\frac{1}{12}\right)^{1/4} = b = \sqrt[4]{1/12}$

A: Initial Value based on the Max Capacity $\boxed{y=\frac{100}{1+4\left(\frac{1}{12}\right)^{\frac{1}{4}x}}}$ $\underline{\underline{1910}} \to 4200$ $1930 \to$	B) Initial Population = 20, Max Capacity (Limit to growth) = 100 Passing through (4, 75) $\boxed{y=\frac{100}{1+A\cdot b^x}}$ $\quad 20=\frac{100}{1+Ab^0}$ $\quad 75=\frac{100}{1+4b^4}$ $20=\frac{100}{1+A}$ $\quad 1+4b^4=\frac{100}{75}$ $\boxed{y=\frac{100}{1+4\left(\sqrt[4]{\frac{1}{12}}\right)^x}}$ $\quad 1+A=\frac{100}{20}$ $\quad 1+4b^4=4/3$ $1+A=5$ $\quad \frac{4b^4}{4}=\frac{(1/3)}{4}$ $A=4$ $\quad b^4=1/12$ 32. Exponential Growth: The population of River City in the year 1910 was 4200. Assume the population increased at a rate of 2.25% per year. $\downarrow .0225$ a) Estimate the population in 1930. $y=ab^x$ $\quad y=4200(1.0225)^x$ $y=4200(1.0225)^{20}$ b) Predict when the population reached 20,000. $\frac{20000}{4200}=\frac{4200(1.0225)^x}{4200}$ $\quad \ln\left(\frac{20000}{4200}\right)=\ln(1.0225)^x$ $\frac{20000}{4200}=1.0225^x$ $\quad \ln\left(\frac{20000}{4200}\right)=x\ln(1.0225)$ $\boxed{\ln(20000/4200)/\ln(1.0225)=x}$ Example 4: Suppose the half-life of a certain radioactive substance is 20 days and there are 5 grams present initially. A) Express the amount of the substance remaining as function of time. B) Find the time when there will be 1 gram of the substance remaining.

$$\boxed{t = \frac{\ln\left(\frac{.2}{39}\right)}{-.9}}$$

Watauga High School has 1200 students. Bob, Carol, Ted and Alice start a rumor, which spreads logistically so that $S(t) = \frac{1200}{1+39e^{-0.9t}}$ models the number of students who have heard the rumor by the end of day t.

A) How many students have heard the rumor y the end of Day 0.

$$S(0) = \frac{1200}{1+39e^{-.9(0)}} = \frac{1200}{1+39} = \frac{1200}{40} = 30$$

B) How long does it take for 1000 students to hear the rumor?

$$1000 = \frac{1200}{1+39e^{-.9t}}$$

$$1+39e^{-.9t} = \frac{1200}{1000}$$

$$1+39e^{-.9t} = 1.2$$

$$\frac{39e^{-.9t}}{39} = \frac{.2}{39}$$

$$e^{-.9t} = \frac{.2}{39}$$

$$\ln e^{-.9t} = \ln\left(\frac{.2}{39}\right)$$

$$-.9t = \ln(.2/39)$$

Use the data in the table and exponential regression to predict Dallas, TX population in 2015.

1950	434,462
1960	679,684
1970	844,401
1980	904,599
1990	1,006,877
2000	1,1888,589