WS#4-9

9.) Now put 200 in Y_2, graph, 2^{ND} trace → intersect $\boxed{t \approx 14.89 \text{ DAYS}}$

4. Chemistry A chemist has a 1000-gram sample of a radioactive material. She records the amount of radioactive material remaining in the sample every day for a week and obtains the following data:

Day	Weight (in Grams)
0	1000.0
1	897.1
2	802.5
3	719.8
4	651.1
5	583.4
6	521.7
7	468.3

(a) Using a graphing utility, draw a scatter diagram with day as the independent variable.
(b) Using a graphing utility, fit an exponential function to the data.
(c) Express the function found in part (b) in the form $A(t) = A_0e^{kt}$.
(d) Graph the exponential function found in part (b) or (c) on the scatter diagram.
(e) From the result found in part (b), find the half-life of the radioactive material.
(f) How much radioactive material will be left after 20 days?
(g) When will there be 200 grams of radioactive material?

a.) STAT → Enter → put the values into L_1 + L_2. Xmin −5, Xmax 50, XSCL 10, Ymin 0, Ymax 1100, YSCL 50

b.) STAT → CALC → ExpReg → 2^{ND} 1, → 2^{ND} 2, → VARS → YVARS → Function → Y_1 → Enter

c.) $ab^x = A_0e^{kt}$, $a = A_0$, $x = t$

since $y = 998.907(.8976)^x$, $a = 998.907$ and $b = .8976$. Therefore, $A_0 = 998.907$

To find K, $0.8976 = e^K$ and solve. $K = \ln(.8976)$ → −.1080. As a result $\boxed{y = 998.907e^{-0.1080t}}$

d.) graph on calc (put in Y_1)

e.) Put 500 in Y_2, graph, 2^{ND} trace → intersect $\boxed{t \approx 6.4 \text{ DAYS}}$

f.) 2^{ND} TRACE → value → 20 → Enter $\boxed{115.2 \text{ grams}}$

10. Population Model The following data represent the world population. An ecologist is interested in finding a function that describes the world population.

Year	Population (in Billions)
1993	5.531
1994	5.611
1995	5.691
1996	5.769
1997	5.847
1998	5.925
1999	6.003
2000	6.080
2001	6.157

Source: U.S. Census Bureau

(a) Using a graphing utility, draw a scatter diagram of the data using year as the independent variable and population as the dependent variable.
(b) Using a graphing utility, fit a logistic function to the data.
(c) Using a graphing utility, draw the function found in part (b) on the scatter diagram.
(d) Based on the function found in part (b), what is the carrying capacity of the world?
(e) Use the function found in part (b) to predict the population of the world in 2004.
(f) When will world population be 7 billion?
(g) Compare actual U.S. Census figures to the prediction found in part (e).

a.) STAT → Enter → put the table values in L_1 + L_2. Let 1993 = 0, 1994 = 1, and so forth. Xmin = −1, Xmax = 30, XSCL 2, Ymin 5, Ymax 7.5, Yscl = .1

b.) STAT → CALC → Logistic → 2^{ND} 1, → 2^{ND} 2, → VARS → YVARS → Function → Y_1 → Enter

c.) $y = \dfrac{10.05267}{1 + 0.8174e^{-0.032t}}$

d.) carrying capacity ≈ $\boxed{10.053 \text{ billion people}}$

e.) 2004 would be represented by the number 11 in this table

2^{ND} Trace → value → 12 → Enter

population ≈ $\boxed{6.38 \text{ billion people}}$

f.) Put 7 in Y_2, graph, 2^{ND} trace → intersect $t \approx 19.64$, thus in $\boxed{2012}$