5. The table gives estimates of the world population, in millions, from 1750 to 2000:

Year	Population	Year	Population
1750	790	1900	1650
1800	980	1950	2560
1850	1260	2000	6080

(a) Use the exponential model and the population figures for 1750 and 1800 to predict the world population in 1900 and 1950. Compare with the actual figures. 1900: 1439.474 1950: 1758.177

(b) Use the exponential model and the population figures for 1850 and 1900 to predict the world population in 1950. Compare with the actual population. $P(t) = 1260e^{.0053t}$ 2077.387

(c) Use the exponential model and the population figures for 1900 and 1950 to predict the world population in 2000. Compare with the actual population and try to explain the discrepancy. 4058.345

6. The table gives the population of the United States, in millions, for the years 1900–2000.

Year	Population	Year	Population
1900	76	1960	179
1910	92	1970	203
1920	106	1980	227
1930	123	1990	250
1940	131	2000	275
1950	150		

(a) Use the exponential model and the census figures for 1900 and 1910 to predict the population in 2000. Compare with the actual figure and try to explain the discrepancy. $P(t) = 76e^{.019t}$ 508.128 million

(b) Use the exponential model and the census figures for 1980 and 1990 to predict the population in 2000. Compare with the actual population. Then use this model to predict the population in the years 2010 and 2020. $P(t) = 227e^{.0097}$ 277.258 306.418 338.644

(c) Graph both of the exponential functions in parts (a) and (b) together with a plot of the actual population. Are these models reasonable ones?

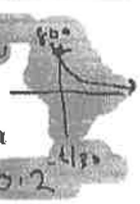
8. Bismuth-210 has a half-life of 5.0 days.

(a) A sample originally has a mass of 800 mg. Find a formula for the mass remaining after t days. $m(t) = 800e^{-.139t}$

(b) Find the mass remaining after 30 days. 12.362 mg

(c) When is the mass reduced to 1 mg? 48.090 days

(d) Sketch the graph of the mass function.



9. The half-life of cesium-137 is 30 years. Suppose we have a 100-mg sample. $m(t) = 100e^{-.023t}$ $m(t) = 100 \cdot 2^{-t/30}$

(a) Find the mass that remains after t years.

(b) How much of the sample remains after 100 years? 9.92 mg

(c) After how long will only 1 mg remain? 200 yrs

10. After 3 days a sample of radon-222 decayed to 58% of its original amount.

(a) What is the half-life of radon-222? 3.82 days

(b) How long would it take the sample to decay to 10% of its original amount? $t = 12.679$ days