

AP Statistics Chapter 4.1: Nonlinear Modeling – Review

1. **Population of Mexico** – Over short periods of time, population of cities, states and countries sometimes grow exponentially. Find an *exponential* model for the population of Mexico for the time period shown and, from it, determine the rate at which the population is growing annually. Use your model to predict the population of Mexico in 1990.

Year (code)	Population (millions)
1980 (0)	67.38
1981 (1)	69.13
1982 (2)	70.93
1983 (3)	72.77
1984 (4)	74.66
1985 (5)	76.60
1986 (6)	78.59

2. **Moore’s Law** – Gordon Moore, one of the founders of Intel Corporation, predicted in 1965 that the number of transistors on an integrated circuit chip would double every 18 months. This is known as Moore’s Law. Using the numbers in the bold columns, find and analyze an *exponential* model for this data to assess Moore’s prediction. What do the numbers A and B tell us in your exponential function?

Processor	Year	Code	Transistors	In 1000’s
4004	1971	0	2,250	2.25
8008	1972	1	2,500	2.5
8080	1974	3	5,000	5
8086	1978	7	29,000	29
286	1982	11	120,000	120
386	1985	14	275,000	275
486 DX	1989	18	1,180,000	1180
Pentium	1993	22	3,100,000	3100
Pentium II	1997	26	7,500,000	7500
Pentium III	1999	28	24,000,000	24000
Pentium 4	2000	29	42,000,000	42000

3. **Atlantic Ocean Rockfish** – The table shows the average length & weight for the Atlantic Ocean Rockfish for the first 10 years of its life. Find a *power* model for this relationship. Suppose that the average length of this fish at age 11 is 29.2 cm. Using your model, predict the average *weight* of the fish at age 11.

Age (yr)	Length (cm)	Weight (g)
1	5.2	2
2	8.5	8
3	11.5	21
4	14.3	38
5	16.8	69
6	19.2	117
7	21.3	148
8	23.3	190
9	25.0	264
10	26.7	293

4. **Planet Orbits** – The table shows the distance from the sun and orbit time, in earth years, for the 9 planets. Actually, you may recall that Pluto lost its membership in the exclusive club a few years ago. For the purpose of this data analysis, we will allow Pluto to stick around. Find a *power* model for this data. Once you have, use it to predict the orbit time for a mysterious 10th planet that is 4,037 miles from the sun.

Planet	Distance from Sun (millions of miles)	Orbit Time (years)
Mercury	36	0.24
Venus	67	0.62
Earth	93	1.00
Mars	142	1.88
Jupiter	483	11.9
Saturn	887	29.5
Uranus	1,785	84.0
Neptune	2,797	165.0
Pluto	3,675	248.0