Cellular Industry Marketing Organization
115 East Fifth Avenue
New York, NY 02348

Independent Mathematical Contractors
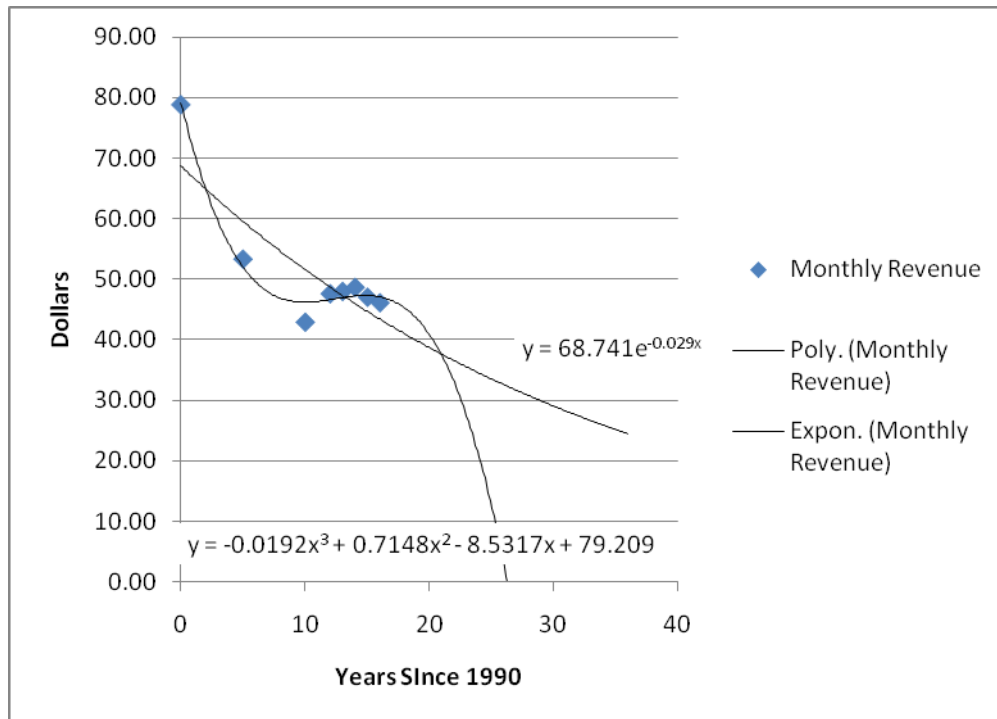Any College
1 Your Street
City, State 00000

Dear IMC:

Over the past fifteen years, the cellular phone industry has been criticized for bringing in too much money. Like the oil companies, our large revenues have made us the whipping buy of several Congressional investigations. Some Congressmen have even floated the idea of raising taxes on the industry in the form of a windfall profits tax. My organization represents the cellular industry in Washington has been charged with developing a strategy to defeat these Congressional attacks.

In the table below, you'll find data regarding the number of cell phone subscribers, service revenue and roamer revenue. Service revenue is the money brought in from subscribers on their service plan. Roamer revenue is the money brought in from subscribers using our services outside their service area.

Years since 1990	0	5	10	12	13	14	15	16
Subscribers (thousands)	5,283	33,786	109,478	140,766	158,722	182,140	207,896	233,041
Service Revenue (millions of dollars)	4,548	19,081	52,466	76,508	87,624	102,121	113,538	125,457
Roamer Revenue (millions of dollars)	456	2,542	3,883	3,896	3,766	4,210	3,786	3,494

From this table, you can see why the cellular industry has been under attack-our revenues have grown by over 2600%! But this masks what is really going on. While it is true that revenue has grown by a huge amount, this is due to the fact that the number of subscribers has grown by a huge amount. The monthly revenue paid by individuals has dropped from $78.93 in 1990 to $46.11 in 2006. My organization needs to convince legislators that wireless service has actually gotten cheaper for consumers and will continue to be reasonably priced in a fashion that is dictated by good business practices and competition.

I calculated the monthly revenue from each consumer in each of the years above and attempted to fit the data with a cubic polynomial function and an exponential function. As you can see below, the monthly bill paid by consumers started off high, but as competition increased the monthly bill dropped to between $40 and $50. You should note that the polynomial regression model would predict that the monthly bill should continue to drop and that is not realistic. The exponential model decreases and eventually approaches 0. This is also not realistic. I would expect that in the long term, the average monthly bill paid by consumers will be somewhere around $50.

Chart: Dollars vs. Years Since 1990

Legend: Monthly Revenue; Poly. (Monthly Revenue); Expon. (Monthly Revenue)

$y = 68.741e^{-0.029x}$

$y = -0.0192x^3 + 0.7148x^2 - 8.5317x + 79.209$

Y-axis: Dollars (0.00 to 90.00)
X-axis: Years Since 1990 (0 to 40)

I have spent a great deal of time on this approach and as you can see, I haven't had much success. I need your help to continue my efforts as I have other tasks that require my attention. I would like you to model the subscribers and revenue individually and then use those formulas to develop a function that describes the average monthly bill paid by consumers as a function of time. Here is a strategy you might try:

1. Make a scatter plot of the subscribers as a function of time.
2. Find an appropriate regression model for the scatter plot in 1.
3. Make a scatter plot of the total revenue as a function of time.
4. Find an appropriate regression model for the scatter plot in 3.
5. Use the two regression models from 2 and 4 to create a function that models the average monthly revenue received from each subscriber as a function of time.
6. Use your function from 5 to predict the average monthly revenue received from each subscriber in 2008 + L, where L is the number of letters in your middle name.
7. Explain how your model reflects my contention that the average monthly revenue received from each subscriber will stabilize around $50 per month. At what price will it stabilize at?

We expect that the report will be in technical memo format. A scientific expert (your instructor) is available to answer any questions that you might have in the course of your investigations. This expert will not be available to assist on this project over the weekend before it is due. You should plan on consulting with this expert as soon as possible.

Warmest regards

Ken U. Hareme, Project Director