Midterm 1

- Don't panic.
- You *may* use your computer and/or calculator.
- You *may* use your notes, book, another person, or any other content resource.
- Print off any Excel work and staple the sheets *in order* along with the problems to which they correspond.
- There is a very high level of professionalism expected with this assessment; make sure the final deliverable you submit is clear, concise and properly documented.
- This assessment is due **Wednesday 27 February** at **noon** outside my office **Babson 316**.
- Make a study copy of this assessment before you submit it.

(1) You may have heard in the news that Greece's economy is in really bad shape. One way a country's financial health is measured is the debt-to-GDP ratio. (GDP stands for "gross domestic product" which is the value of all goods and services produced by a country.) In 1980, Greece's debt-to-GDP ratio was a fiscally responsible 25%. In 2010, it had skyrocketed to around an astonishing 145%, and this year the ratio is expected to be even worse.

(a) What is your best guess as to when Greece's debt equaled its GDP?

(b) What is your best guess as to when Greece's debt will be 4 times its GDP?

(c) What is your best guess as to Greece's debt-to-GDP ration in 2150? Do you trust this prediction? Why or why not?

Price	Demand	Supply
0	32	0
5	17	0
10	11	10
15	5	16
20	0	24
25	0	30

Table 1: Price (dollars per unit), supply (units per month), and demand (units per month) data

(2) Over the past year or so, you've been collecting data on how many units of your product your customers demand, and how many units of your product you're willing to sell, when you set the price per unit of your product at various levels. The data you've collected is summarized in Table 1. Write a single (perhaps piecewise) linear model that approximates the number units your business sells.

(3) You own a ice cream stand on a popular Maine beach. You have been collecting data for the past 10 years about your company's performance, and you're looking to figure out what exactly is driving sales growth. You have two main hypotheses. The first is that global warming is causing people to want a cool treat more frequently. The second is that the median household income in town in which your stand is located is increasing which might imply that people on the beach have more disposable income. To get a handle on figuring out which of these hypotheses is better, you've collected the data featured in Table 2.

Year	**Total Sales**	**Average Temp.**	**Median Income**
2000	27.93	86.92	30.11
2001	28.29	88.51	31.48
2002	29.70	88.01	32.03
2003	31.09	87.05	33.34
2004	31.12	90.22	34.20
2005	30.12	85.52	35.26
2006	31.83	87.45	36.36
2007	34.61	85.85	37.43
2008	37.37	86.14	38.33
2009	37.80	87.88	39.31

Table 2: Data collected for the total sales (thousands of dollars), average temperate (degrees Fahrenheit), and median household income (thousands of dollars) for June of the indicated year

Restricting your analysis to linear models, is temperature or median income a better predictor of your sales?

(4) After leaving Babson, you and some fellow alums launched a new microbrewery venture. After resounding success, you've opened two main brewing facilities, one in South Boston and the other in Windsor, Vermont. As an entrepreneur, you're both CEO and production/distribution coordinator. Your responsibilities in the second role are twofold. First, you must set the output, measured in barrels of beer, of each brewing facility. Second, you must assign each barrel produced to one of your two main markets: Boston and New York. You know from historical data that the Boston market orders on average 500 barrels per month, while the New York market orders 530 barrels per month. You also know that your facilities are not identical: the flagship facility in South Boston can produce up to 620 barrels per month, while the satellite facility in Windsor can only produce up to 410 barrels per month. Furthermore, you have some transportation cost data which is summarized in Table 3

Origin	**Destination**	**Cost**
Windsor	Boston	10
Windsor	New York	20
South Boston	Boston	5
South Boston	New York	10

Table 3: Transportation cost ($/barrel) from each brewing facility to each market

Your total monthly transportation budget is $6,550. In order to maximize your market share, you'd like to ship as many barrels as possible. What production levels and distribution orders do you send to each brewing facility?