Module 3 Final Project
Due 3$^{\text{rd}}$ November 2008

Your group has been given the reference for a research paper, and a set of data taken from the paper. Read the paper with sufficient depth to know what the data is measuring. Use the techniques that you have seen in the lectures to find three models for the given data of form given to you. Decide which model is the most appropriate for the data

Your group will be given 10 minutes to present its work to the class during either November 3's lecture or Novemeber 5's lecture. The group will then have to answer at least two questions from the audience. The presentation should cover the following (not necessarily in order):

- The physical meaning of the data.

- The three types of model that were fitted to data.

- The methods used to find the values of the parameters of the models.

- Evidence for and against the validity of each model.

- You final decision about which model was most suitable, with your justifications.

At the end of the presentation, the group will save the Mathematica workbook they used plus any other files they presented, and submit it in Moodle. Each student will give a grade to each presentation not given by their group.

On Monday, November 3, three groups will be selected, at random, to present their work. It will be an Honor Code violation for the two remaining groups to do any further work on their projects.

Module 3 Project for Group S1G1
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1   Research Paper

Authors Akira Watanabe, Masahiro Kasuya, Ayumi Tsunekawa, Mieko Maeda,
 Atsuko Sugimoto, Makoto Kimura

Year 2008

Title Spatial and seasonal variations in CH4 in groundwater used for agricul-
 ture in central Japan.

Journal Agriculture, Ecosystems and Environment, 127 (2008) 207–214

Web-site `www.elsevier.com/locate/agee`

2   Data

Month (0=January)	Methane production rate (nmol L^{-1} day^{-1})
0	3.08
7	4.61
10	-1.65
15	1.31

3   Models

3.1   Exact Fit Polynomial

Find a polynomial model that passes through all the data points.Note that the
first homework assignment of this module was to find this model.

3.2   Cyclic Model with a 12 month period

Fit an optimal model of the form:

$$1.8375 + A\sin\left(\frac{2\pi}{12}t\right) + B\cos\left(\frac{2\pi}{12}t\right)$$

3.3   Cyclic Model with a 6 month period

Fit an optimal model of the form:

$$1.8375 + A\sin\left(\frac{2\pi}{6}t\right) + B\cos\left(\frac{2\pi}{6}t\right)$$

4 Conclusion

Select the model that is most suitable for the data. When making this choice it will help to ask yourselves which model :

a. matches the data most accurately?

b. best captures the general pattern and trends of the data?

c. is the most efficient description of the data?

d. will make the most reliable predictions of future behaviour?