B.E. International Program

Faculty of Economics, Thammasat University

Course Outline

MA217 Calculus for Social Science 2

Semester: 1/2011 (8 August – 30 November 2011)
Time: Saturday, 09:00-12:00 hrs.
Room: _____, Faculty of Economics, Thaprachan
Instructor: Anchalee Manonukul, D.Phil. (Oxon)
TA: Mr. Athip Tansutat
E-mail: anchalm@mtec.or.th (the best way to get in touch with me)
Prerequisite: MA 216

Course Goal:
Calculus has influenced nearly every branch of natural and social sciences, since its invention about three hundred years ago. Calculus is not only one of the most beautiful ideas in the history of human thought, but also one of the most useful and influential. This course is designed to train students to understand and appreciate both theory and calculation. In each topic, students will not only learn how to solve the problem but also learn the concepts, the hypotheses behind and how to apply them correctly. The student should be able to understand and apply the topics covered in the course which are: Matrices, determinants, solutions of system of linear equations, higher order partial derivatives, application of maximum and minimum of several variables functions with unconstraint and constraint, techniques of integration for one variable functions, polar coordinates and area in polar coordinates, multiple integration and its applications.

Reading lists:
In addition of attending lectures and following handouts and assignments, students are recommended to consult textbooks for further examples and alternative explanations. The class discussion will follow Hoffman and Bradley (2007) and Klein (2002) which give many economic examples and other fields. Other books are also suitable. If you already have a similar book, it is not absolutely necessary to acquire another one.

1. **Hoffman, L.D. and Bradley, G.L.,** *Calculus for Business, Economics, and the Social and Life Sciences*, 9th edition, McGraw Hill, 2007. (Recommended)
2. **Klein, M.,** *Mathematical Methods for Economics*, 2nd Edition, Pearson Education, 2002. (Recommended)
3. **Chiang, A. and Wainwright, K.,** *Fundamental Methods of Mathematical Economics*, 4th Edition, McGraw-Hill, 2005.
4. **Barnett, R., Zeigler, M. and Byleen,** *College Mathematics for Business and Economics, Life Science, and Social Science*, 10th edition, Pearson Education, 2005.
5. **Haeussler, E.F.Jr., Paul, R.S., and Wood, R.,** *Introductory Mathematical Analysis for Business, Economics, and the Life and Social Sciences*, 11th edition, Prentice Hall, 2006.
6. **Sydsaeter, K. and Hammond, P.J.,** *Mathematics for Economic Analysis,* Prentice Hall, 2002.
7. **Simon, C., and Blume L.,** *Mathematics for Economists*, Norton & Company, 1994.

Calculator during Examination:

- ☐ No calculator
- ☐ A non-scientific calculator
- ☐ A basic scientific calculator (with exponential and logarithmic functions) but not graphical calculator
- ☐ A scientific and graphical calculator
- ☐ Other e.g. …….

Familiarise yourself with your calculator.

Grading:

There will be …… quizzes during classes which will be announced beforehand, a midterm examination and a final examination. The course grades will be determined as following:

Quizzes	10%
Midterm (Saturday 1 October 2011, 9.00-10.30 hrs.)	40%
Final (Saturday 3 December 2011, 9.00-12.00 hrs.)	50%

Tentative Schedule and Course Outline

Section	Date	Topic
1	13 Aug	Functions of several variables (Revision)
2	20 Aug	Application of maximum and minimum of several variables functions with unconstraint
3	27 Aug	Application of maximum and minimum of several variables functions with constraint
4	3 Sept	Application of maximum and minimum of several variables functions with constraint (cont.)
5	10 Sept	Application of maximum and minimum of several variables functions with constraint (cont.)
6	17 Sept	Techniques of integration for one variable functions
7	24 Sept	Techniques of integration for one variable functions (cont.)
	Sat 1 Oct	***Midterm examination, 9:00-10:30 hrs.***
8	8 Oct	Polar coordinates and area in polar coordinates
9	15 Oct	Polar coordinates (cont.)
10	22 Oct	Multiple integration and its applications
11	29 Oct	Multiple integration and its applications (cont.)
12	5 Nov	Matrices, Algebra of Matrices, Elementary Operations
13	12 Nov	The inverse of a matrix, Determinants, Some Properties
14	19 Nov	Solutions of system of linear equations
15	26 Nov	Revisions of Examination
	Sat 3 Dec	***Final examination, 9:00-12:00 hrs.***

!!!!! Familiarise yourself with this. !!!!!
!!!!! This is what you will be given in your examination. !!!!!

Formulas

Differentiation

We assume that u is a differentiable function of x.

$$\frac{d}{dx}(c) = 0$$

$$\frac{d}{dx}\left(x^n\right) = n\,x^{n-1}$$

$$\frac{d}{dx}\left[c\ f(x)\right] = c\,f'(x)$$

$$\frac{d}{dx}\left[f(x) \pm g(x)\right] = f'(x) \pm g'(x)$$

$$\frac{d}{dx}\left[f(x)g(x)\right] = f(x)g'(x) + f'(x)g(x)$$

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{\left[g(x)\right]^2}$$

$$\frac{dy}{dx} = \frac{dy}{du}\cdot\frac{du}{dx}$$

$$\frac{d}{dx}\left(u^n\right) = n\,u^{n-1}\frac{du}{dx}$$

$$\frac{d}{dx}(\ln u) = \frac{1}{u}\frac{du}{dx}$$

$$\frac{d}{dx}\left(e^u\right) = e^u\frac{du}{dx}$$

$$\frac{d}{dx}(\log_b u) = \frac{1}{(\ln b)u}\cdot\frac{du}{dx}$$

$$\frac{d}{dx}\left(a^u\right) = a^u(\ln a)\frac{du}{dx}$$

Newton's Approximation Method:

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)} \qquad \text{where } n = 0, 1, 2, \ldots$$

Integration

$$\int k\,dx = kx + C$$

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C,\ n \neq -1$$

$$\int e^x dx = e^x + C$$

$$\int kf(x)dx = k\int f(x)dx$$

$$\int\left[f(x) \pm g(x)\right]dx = \int f(x)\,dx \pm \int g(x)\,dx$$

$$\int [u(x)]^n du = \frac{u^{n+1}}{n+1} + C$$

$$\int e^u du = e^u + C$$

$$\int \frac{1}{u}du = \ln|u| + C,\ u \neq 0$$

Integration by Parts

$$\int f(x)g'(x)dx = f(x)g(x) - \int f'(x)g(x)dx, \quad \int u\,dv = uv - \int v\,du$$