Soft Computing
Kai Goebel/Bill Cheetham
Homework 2: fuzzy logic operations
Due: Tuesday September 11th at the beginning of class (no later than 6:10pm)

1.) exercise 9, page 44 of Jang et al. Note that the exercise uses definitions from exercises 6 and 7 (pp. 43-44); 4 points

2.) Consider the following matrix defining a fuzzy relation R on XxY

	y_1	y_2	y_3	y_4	y_5
x_1	0.5	0	1	0.9	0.9
x_2	1	0.4	0.5	0.3	0.1
x_3	0.7	0.8	0	0.2	0.6
x_4	0.1	0.3	0.7	1	0

Give the projections of R onto X and Y. Then perform a cylindrical extensions of the projection relations $\mu_R(x)$and $\mu_R(y)$, Display the four resulting sets using matlab; 4 points

3.) Let the universe be X={1,2,3,4} and "small integers" be defined as A={(1,1), (2,0.5), (3,0.4), (4,0.2)}
Let the fuzzy relation "almost equal" be defined as

	1	2	3	4
1	1	0.8	0	0
2	0.8	1	0.8	0
3	0	0.8	1	0.8
4	0	0	0.8	1

What is the membership function of the fuzzy set B="rather small integers" if it is interpreted as the composition $A \circ R$? Use max-min composition; 2 points

4.) exercise 6, page 70 of Jang et al. Note that there is a typo; replace "old" with "young" and "small" with "old"; Note also that the equations of exercise 5 should read:

$$\mu_{young}(x) = gaussian(x,0,20) = e^{-\frac{1}{2}\left(\frac{x}{20}\right)^2}$$

$$\mu_{old}(x) = gaussian(x,100,30) = e^{-\frac{1}{2}\left(\frac{x-100}{30}\right)^2}$$

3 points

5.) exercise 3, page 90 of Jang et al.; 4 points

General submission guidelines:
Please submit graphs and numerical output in class as a hard copy. Submit source code electronically to the email of the instructors (goebel@cs.rpi.edu, cheetham@cs.rpi.edu). If possible, zip up the source code files and use your last name as the archive name. Identify the homework in the subject line.