Lab Practice Week 3
To be submitted as C Exercise 1 by Week 5

Internal Students: You need to show a working version of your solutions to program 5, 6 and 7. Your tutor will expect to see your submission during your lab class in or before week 5.

External Students: Please email your Program 5, 6 and 7 to your tutor. Your tutor will expect to receive them by the end of week 5.

Program 5

Write a C program that prints out the character set from A to Z together with the ASCII value of each character in decimal form. Modify this program so that it also outputs the ASCII values in hexadecimal form. The output from the program should be in the form of a table as follows:

<table>
<thead>
<tr>
<th>Character</th>
<th>ASCII value in decimal</th>
<th>ASCII value in hexadecimal</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>65</td>
<td>41</td>
</tr>
<tr>
<td>B</td>
<td>66</td>
<td>42</td>
</tr>
<tr>
<td>Z</td>
<td>90</td>
<td>5a</td>
</tr>
</tbody>
</table>

Program 6

Write and test a C function which takes an integer argument and returns an integer result. This function f(x) shall return the value:

\[ f(x) = 1 \text{ if } x = 0; \text{ and} \]
\[ f(x) = x \times (x-1) \times (x-2) \times … \times 2 \times 1; \text{ if } x \text{ is greater than } 1. \]

For example, f(5) = 5*4*3*2*1 = 120. Test your function with the arguments 0, 1, 3, 5, 10, and 12. Explain your results.

Program 7

Write and test a C program that uses the function f(x) of program 6 and then calculates \( y^x \), for a given floating point value y and an integer value x.

The program should then add all the calculated values for x in the range 0 to 6. Print the value of each term, and the progressive total to an accuracy of 4 decimal places. Test your program with y values between 1.0 and 2.2.

Note: While you may develop your program in any platform or compiler, all programs are expected to be able to run in the Cygwin environment. Even you may not be able to produce the complete program in the lab session, you MUST record and show your work to your tutor, otherwise no marks will be given. You should be able to give the following information:
1. An overall design of the program (How does the program work?)
2. Algorithm of the program (How do you process the data?)
3. Code and comments (What have you developed?)
4. Results (What are the outputs from the program?)
5. Testing (How did you test it?)
6. Discussion (Does it work? If no, what will you do next? If yes, how can it be improved?)