Phys234, 2018, Problem set #1: Due Monday January 29, 8pm

Question 1:

Write a function file `ps1q1.m` in which you first create the matrix C

$$C = \begin{bmatrix} 11 & 5 \\ 21 & 1 \\ 18 & 7 \end{bmatrix}$$

In the same file, write the two statements to create the column vectors

$$s = [11, 21, 18]^T \qquad t = [5, 1, 7]^T$$

by **extracting** the columns of C. Execution of your function `ps1q1.m` on the command line should print both s and t:

```
>> ps1q1
s= 11
   21
   18
t= 5
   1
   7
```

Question 2:

Use the `reshape` function with the **colon** notation to create the following matrices:

$$a) \begin{bmatrix} 2 & 8 & 14 & 20 \\ 4 & 10 & 16 & 22 \\ 6 & 12 & 18 & 24 \end{bmatrix} \qquad b) \begin{bmatrix} -5 & -3 & -1 & 1 & 3 & 5 \\ -4 & -2 & 0 & 2 & 4 & 6 \end{bmatrix}$$

Your assignment statement should first create a vector with colon notation and then shape that vector to produce the desired matrix. Write each solution separately in function m-files `ps1q2a.m` and `ps1q2b.m`. Make sure the execution of your functions prints out the answer.

Question 3:

Question 3 will be given at the start of the lab: you will have to show the TA that you have completed it before you exit the lab.

Question 4:

Question 4 will be given at the start of the lab: you will have to show the TA that you have completed it before you exit the lab.

Question 5:

Create an m-file function called `sequint` that returns a matrix having elements that are a sequence of integers arranged by columns. The function should have two inputs, `m` the number of rows, and `n` the number of columns. It should also have one output, the resulting matrix. For example, the statements `A=sequint(2,3)` and `B=sequint(4,4)` should produce the following matrices:

$$\begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & 6 \end{bmatrix} \qquad \begin{bmatrix} 1 & 5 & 9 & 13 \\ 2 & 6 & 10 & 14 \\ 3 & 7 & 11 & 15 \\ 4 & 8 & 12 & 16 \end{bmatrix}$$

Write a function file `ps1q5.m` that produces both of these tests by calling the function `sequint`.

Question 6:

Write two function m-files called `FtoC` and `CtoF`, to convert temperatures from degrees Fahrenheit to degrees Celsius and from degrees Celsius to degrees Fahrenheit. Each function should have one input parameter and one output parameter. Write a function file `ps1q6.m` to test your functions with the following 4 cases:

```
FtoC(CtoF(100))
CtoF(FtoC(32))
FtoC(0:10:100)
CtoF(0:10:100)
```

Question 7:

Write a function `tridiag1` that uses the built-in Matlab function `diag` to create a symmetric tridiagonal n by n matrix that looks like

$$\begin{bmatrix} a & b & 0 & 0 & \cdots & 0 \\ b & a & b & 0 & \cdots & 0 \\ 0 & b & a & b & \cdots & 0 \\ \vdots & & \ddots & \ddots & \ddots & \\ 0 & 0 & \cdots & b & a & b \\ 0 & 0 & \cdots & 0 & b & a \end{bmatrix}$$

where a and b are scalar numbers. So the diagonal elements are all equal to a and the off-diagonal elements are all equal to b. Here, n is the dimension of the matrix: it is an integer and corresponds to the the number of rows and columns. Write your function such that a, b and n are input parameters, i.e. in the form

```
function A = tridiag1(a,b,n)
```

To test your function, write a function file `ps1q7.m` that calls `tridiag1` with the following arguments

```
tridiag1(2,-1,5)
```