Strathmore
UNIVERSITY

DISTRIBUTED OBJECTS AND WEB SERVICES
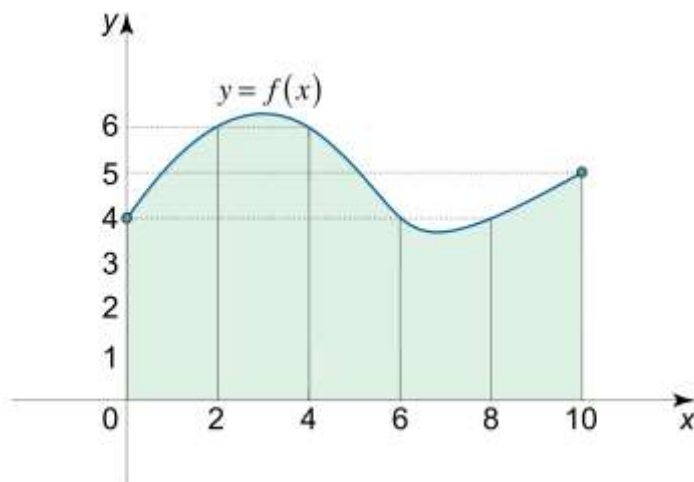
DATE: 13th October 2020   Time: 3 Hours

1. Use a programming language of your choice
2. This exercise is to be completed within the 3 hours of class.
3. The results will be submitted to the e-learning platform

A. Calculate the Area under the curve

    i.   Consider the following diagram:

Write a script that will be used to calculate the area under the curve, $y=f(x)$
between $x=0$ and $x=10$ using the Trapezoidal Rule with $n=5$ subintervals.

B. Parallel Computing Using Message Passing Interface

    i)   Download MPI

    ii)   Integrate MPI with a programming language (*C, C++, Python etc*)

    iii)   Using MPI send and receive functions, write a simple script to send and receive
          message between processes.

Example of processes sending and receiving messages in python:

```python
C: > Users > Administrator >  test_mpi.py > ...
1    from mpi4py import MPI
2    comm = MPI.COMM_WORLD
3    rank = comm.Get_rank()
4    number_of_processors= comm.Get_size()
5
6    if rank !=0:
7        message="Hello from" + str(rank)
8        comm.send(message,dest=0)
9    else:
10       for procid in range(1,number_of_processors):
11           message=comm.recv(source=procid)
12           print("Process 0 receives message from process",procid,":",message)
```

Output with 4 processes:

```
(tensorflow) C:\Users\Administrator>mpiexec -n 4 python -m mpi4py test_mpi.py
Process 0 receives message from process 1 : Hello from1
Process 0 receives message from process 2 : Hello from2
Process 0 receives message from process 3 : Hello from3
```

C. Find the area under the curve in section(A) using Parallel Computing

i.   Create Processes such that each process calculates a part of the solution

ii.   The results of each process should be sent to process 0

iii.   Process 0 sums the results received and prints the output