**Assignment COM3013 (Week 1)**

1. Try the optimization problem of the lecture for the rectangle: optimize the area (maximum area), decision variables are *x*1 and *x*2 and perimeter is fixed at 20. Try to optimize this using gradient descent. Hint: rewrite the function of area in terms of *x*1 only.  
   Take *x*1 = 6.0 as initial guess. Optimize for four steps using each of the following step sizes (i.e. start again each time from *x*1 = 6.0, using the new step size):
   * 0.4
   * 0.6
   * 1.0
2. Given the following objective function:

*f* (*x*) *=* 2*x*2*-*4*x +* 5*.*

1. Calculate the derivative of *f* (*x*)
2. Given the initial guess *x*(0) = 4, step size α = 0.1, calculate the next guess *x*(1)
3. Calculate the minimum of *f* (*x*)
4. Do the differentiation to calculate the gradient for this example from the lecture, and verify that you get the same answer:





1. What are the limitations of the gradient methods? What are potential approaches to address the limitations of the gradient methods?