註:本次考試　<u>不可以</u>參考自己的書籍及筆記；　　<u>不可以</u>使用字典；　　<u>不可以</u>使用計算器。

1. Find x and y to maximize the profit $f(x,y) = \$5x + \$3y$ under the constraints:

   $2x + y \leqq 40,\ x + 3y \leqq 30,\ x + y \geqq 10,\ x \geqq 0,$ and $y \geqq 0.$　　　15%

2. Find the solution of the differential equation $y'' - 2y' - 3y = 5\sin x.$

   　　　12%

3. What is the angle θ between two nonzero vectors p and q if

   (a) $p \bullet q = 0,$ (2) $p \bullet q > 0,$ (3) $p \bullet q < 0.$　　　10%

4. Find the critical points of the following function and test for relative extrema
   and saddle points.

   $f(x,y) = (x^2 + 4y^2)\exp(1 - x^2 - y^2).$　　　15%

5. How do you define the conics in terms of the general second-degree equation?
   What is the determinant to determinate whether the graph of the equation is a
   parabola, an ellipse, or a hyperbola?

   　　　12%

6. Use a power series to approximate $\int \exp(-x^2/2)$ in the interval [0,2] with
   an error of less than 0.01.

   　　　12%

7. Find the sum of the first n terms whose xth term is $x^3 + 3x^2.$

   　　　12%

8. Evaluate the following integral over the region R: bounded by

   $x - 2y = 0, x - 2y = -4, x + y = 4,$ and $x + y = 1$　　　12%

   $\int\int_R 3\,dxdy.$