Course Project

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1 Problems and Requirements

1. Problem 1. Given function $F(x, y) = 0.2x^2 + 0.1y^2 + sin(x + y)$, please work out its gradient. Based on the gradient, please find out the local extreme of function F(x,y) when both x and y are in the range of [-2*pi, 2*pi]. The 2D and 3D views of the function is given in Fig. 1.

   - Requirements:
     (a) Work out the gradient for F(x, y) and show it in the report;
     (b) Write Matlab code to find extreme value for F(x, y) by gradient descent method;
     (c) Write a report to show your solution and analysis. Please visualize the gradient descent steps along with either its 3D view or the function contour.

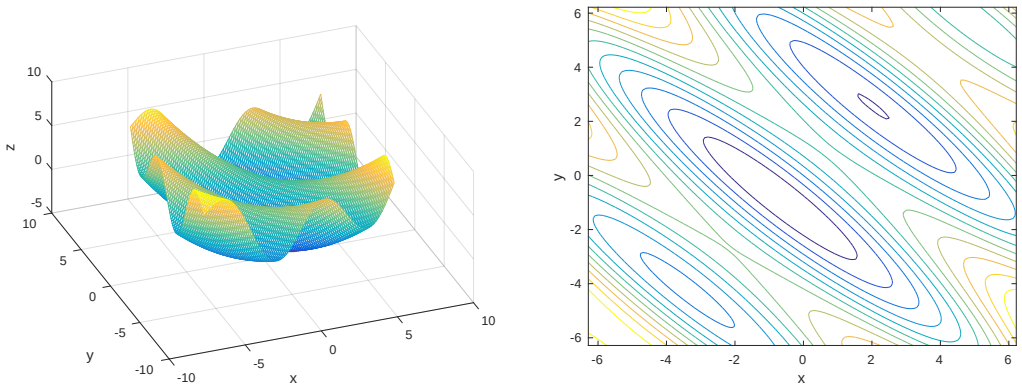
2. Problem 2. A factory supplies engine for its customer. According to the contract, the factory should deliver its product to the customer in the end of the 1st season: 40 engines; in the end of the 2nd season: 60 engines; in the end of the 3rd season: 80 engines. Due to limited productivity, to its most, the factory is only able to produce 100 machines in a single season. The production cost is given as $f(x) = 50x + 0.2x^2$, where x is the number of machines produced in one season. It is possible to produce machines more than the required quota in each season. In this case, the storage cost is 4 dollars for one machine/season. Assuming there is no reservations at the beginning for the first season, please work out a production plan that minimizes the production cost.

   - Requirements
     (a) Model it as a standard quadratic programming problem
     (b) Call 'quadprog' to solve the problem
     (c) Write down the modeling process and show your anwser in the report

2 Submission Requirement

You are required to submit your source code along with a report. A latex template of your report is provided. There should be Matlab source codes for two problems and a PDF report inside your submission package. Your package should be zipped like this "stdnumber.zip".

- No Cheating! Whoever is identified, protocols are implemented.
- Submission file checklist (put them in one folder and zip it)
  - prj1.m



(a) 3D view of F(x, y)

(b) 2D Contour view of F(x, y)

Figure 1: 2D and 3D views of function F(x,y) in Problem 1.

– report1.pdf
– prj2.m
– report2.pdf

3 Sample Codes

```
clear;
%show your student number here if you'd like to
%write down your code here
%no Chinese comments please!!!
%
```

Listing 1: prob1