Numerical Methods Problem Set 6

Due 3/14/2011

1. Find the minimum of

$$\Phi(x, y) = 100(y - x^2)^2 + (1 - x^2)$$

starting at (1,-1) using Powell's method.

2. Given

$$I(p) = \int_0^\pi \sin x \cos(px)dx$$

find p where $I(p)$ is a minimum.
Note: although it can be done, you are not supposed to do the integration analytically. The evaluation of $I(p)$ should be purely numerical.

3. For

$$V(r) = 4[(\frac{\sigma}{r})^{12} - (\frac{\sigma}{r})^6]$$

with σ a constant, find numerically the value of $\frac{\sigma}{r}$, for which $V(r)$ is a minimum.

4. Minimize

$$\phi(x, y) = (x - 1)^2 + (y - 1)^2$$

subject to $x + y \leq 1$ and $x \geq 0.6$.

5 (Extra Credit) Minimize, using Linear Programming method:

$$\xi = 12x + 14y + 17z + w + 0.003v$$

subject to

$$\begin{pmatrix} 1 & 10^4 & 6 & 0 & 10^{-3} \\ 0.1 & 7 & 1 & 10^{-4} & 0 \\ 10 & 0 & 10^{-2} & 10^4 & 10^6 \\ 0.2 & 13 & 0 & 9 & 10^{-4} \end{pmatrix} \begin{pmatrix} x \\ y \\ z \\ u \\ v \end{pmatrix} \geq 0$$