Due Date: Jan. 12th

Problems Due: 2(g)

1. Let $D = [0, 1]$ Let f be an increasing function and g be a decreasing function on D. Convince yourself that f and g both attain their maximum and minimum on D. Does $f + g$ necessarily attain a maximum and minimum on D ?

2. Minimize each of the following functions in the region specified:

   (a) $3x$ in $\{x : x \geq 0\}$
   (b) $x^2 - 2x + 3$ in $\{x : x \geq 0\}$
   (c) $x^2 + 2x + 3$ in $\{x : x \geq 0\}$
   (d) $\lambda_1 x^2 + \lambda_2 x$ in $\{x \geq 0\}$
   (e) $(\lambda_1 - \lambda_2)x$ in $0 \leq x \leq M$ for $\lambda_1, \lambda_2 \in \mathbb{R}, M > 0$
   (f) $x_1^2 + 2x_2^2$ in $\{x_1 + 3x_2 = b\}$ for $b \in \mathbb{R}$.
   (g) $\frac{v_1}{x_1} + \frac{v_2}{x_2}$ in $\{x_1 \geq 0, x_2 \geq 0, a_1 x_1 + a_2 x_2 \leq b\}$ for strictly positive a_1, a_2, v_1, v_2, b

3. Suppose Suppandi-Super Factory produces $y = g(x_1, x_2, \ldots, x_n)$ units of output using x_i units of the $i-th$ input. Let $c = (c_1, c_2, \ldots, c_n)$ be the cost vector. When the firm produces y units, the unit price it can obtain for the product is given by $p(y)$. You are assigned the job of choosing an input mix that will maximise the Suppandi-super factory's profit. Set up the optimisation problem in mathematical terms and decide the hypothesis required for the problem to have a solution. ?