# Re: quadratic minimization: analytical solutions

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In article <1104478990.210548.7520@z14g2000cwz.googlegroups.com>,
y_granik@yahoo.com writes:
*>Consider quadratic non−convex optimization*
*>problems with simple bounds:*
*>*
*>f(x) = xQx+bx −> min*
*>0 <= x <= 1*
*>*
*>When x has only one component, we get*
*>*
*>f(x) = a*x*x+b*x −> min*
*>0 <= x <= 1*
*>*
*>This is pretty simple problem*
*>and can be solved analytically.*
*>If a > 0, then problem is convex and we just have to*
*>compare 2 or 3 values*
*>*
*>f(0), f(1), and f(−b/2a), if 0 < = −b/2a <= 1*
*>*
*>and identify the smallest one.*
*>If a < 0, then the problem is convcave*
*>and we have to compare*
*>*
*>f(0) and f(1)*
*>*
*>to find min.*
*>*
*>The question: does this problem*
*>have analytical solutions in dimensions*
*>high than 1? In particular,*
*>for 2 dimensions, when x = (x1, x2),*
*>can we solve this analytically?*
*>*
*>*
*>This feels like a fundamental*
*>problem of quadratic programing,*

>*but I cannot find it in the books I*
>*have.*
>
>*Please help.*
>
>*Happy New Year!*
>
>*Yuri Granik*
>

no. nonconvex quadratic optimization is np hard.
even in case n=2 you could have any situation concerning the minimizer.
make a little sketch e.g. with Q=[−1 0 ; 0 −1 ] and any b, with the maximum now
at −b/2. depending on the position of −b/2 realtive to the unit box
you could have several local (nonglobal ) minimizer, with b=[−1,−1] four
global minimizer exactly at the four vertices etc etc
hth
peter