SOLVED STANDARD PROBLEM

Referred Paper :
Shashwati Ray, P.S.V. Nataraj. An efficient algorithm for range computation of polynomials using the Bernstein form. *Journal of Global Optimization,* 45: 403-426,2009
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ex1 and ex =0.000001; No. of Iteration : 250

1. Camel back: The six hump camel back function
$f(x,y) = 4*x^2-2.1*x^4+1/3*x^6+x*y-4*y^2+4*y^4$
where, **x,y** = [-3, 3],

zcap =

 - 1.0316285
 Lsol =

   Lsol(1)

 - 0.0898418 - 0.0898418
  0.7126565   0.7126565

   Lsol(2)

  0.0898418   0.0898418
 - 0.7126565 - 0.7126565

2. Booth: The function defined by
f(x,y) = 74-38*x+5*x^2-34*y+8*x*y+5*y^2

XB =

 - 10.   10.
 - 10.   10.
zcap =

  5.116D-13
 Lsol =

  3.0004883   3.0004883
  0.9997559   0.9997559

3. Caprasse's: The system defined by Caprasse
$f(p, q, r, s) = -p*r^3+4*q*r^2*s+4*p*r*s^2+2*q*s^3+4*p*r+4*r^2-10*q*s-10*s^2+2$

where, **p,q,r,s** = [-0.5, 0.5],

zcap =

 - 3.1800966
Lsol =

    Lsol(1)

   0.5   0.5
 - 0.5   - 0.5
 - 0.2412109 - 0.2412109
 - 0.5   - 0.5

    Lsol(2)

   0.5   0.5
   0.5   0.5
 - 0.2412109 - 0.2412109
   0.5   0.5

    Lsol(3)

 - 0.5   - 0.5
 - 0.5   - 0.5
   0.2412109   0.2412109
 - 0.5   - 0.5

    Lsol(4)

 - 0.5   - 0.5
   0.5   0.5
   0.2412109   0.2412109
   0.5   0.5

4. Adaptive LV: A neural network modeled by an adaptive Lotka-Volterra system
$f(p,q,r,s) = p*q^2+p*r^2+p*s^2-1.1*p+1$

where, **p,q,r,s** = [-2, 2],

 zcap =

 - 20.8
 Lsol =

    Lsol(1)

 - 2. - 2.
 - 2. - 2.

```
- 2.  - 2.
- 2.  - 2.
```

       Lsol(2)

```
- 2.  - 2.
- 2.  - 2.
- 2.  - 2.
  2.    2.
```

       Lsol(3)

```
- 2.  - 2.
- 2.  - 2.
  2.    2.
- 2.  - 2.
```

       Lsol(4)

```
- 2.  - 2.
- 2.  - 2.
  2.    2.
  2.    2.
```

       Lsol(5)

```
- 2.  - 2.
  2.    2.
- 2.  - 2.
- 2.  - 2.
```

       Lsol(6)

```
- 2.  - 2.
  2.    2.
- 2.  - 2.
  2.    2.
```

       Lsol(7)

```
- 2.  - 2.
  2.    2.
  2.    2.
- 2.  - 2.
```

       Lsol(8)

```
- 2.  - 2.
  2.    2.
  2.    2.
  2.    2.
```

5. Wright: The system defined by Wright
$f(p,q,r,s,t) = t^2+p+q+r+s-t-10$
where, **p,q,r,s,t** = [-5, 5],

zcap =

  - 30.25
 Lsol =

  - 5.   - 5.
  - 5.   - 5.
  - 5.   - 5.
  - 5.   - 5.
    0.5004883   0.5004883

6. Magnetism in Physics: A six variable magnetism in physics problem
$f(p,q,r,s,t,u) = 2*p^2+2*q^2+2*r^2+2*s^2+2*t^2+u^2-u$

where, **p,q,r,s,t,u** = [-0.5, 0.5],
zcap =

  - 0.25
 Lsol =

   0.   0.
   0.   0.
   0.   0.
   0.   0.
   0.   0.
   0.5   0.5

7. Butcher: A function defined by Butcher
$f(p,q,r,s,t,u) = u*q^2+t*r^2-p*s^2+s^3+s^2-1/3*p+4/3*s$

where,
p = [-1, 0], **q** = [-0.1, 0.9], **r** = [-0.1, 0.5],
s = [-1,-0.1], **t** = [-0.1,-0.05], **u** = [-0.1,-0.03]

zcap =

  - 1.4393333
 Lsol =

   0.   0.
   0.9   0.9
   0.5   0.5
  - 1.   - 1.
  - 0.1 - 0.1
  - 0.1 - 0.1

8. Magnetism in physics: A seven variable magnetism in physics problem
$f(p,q,r,s,t,u,v) = p^2+2*q^2+2*r^2+2*s^2+2*t^2+2*u^2+2*v^2-p$

where, **p,q,r,s,t,u,v** = [-0.5, 0.5],

zcap =

- 0.25
Lsol =

    0.5   0.5
    0.   0.
    0.   0.
    0.   0.
    0.   0.
    0.   0.
    0.   0.

9. Heart dipole: A heart dipole problem
f(p,q,r,s,t,u,v,w) = -p*u^3+3*p*u*v^2-r*v^3+3*r*v*u^2-q*t^3+3*q*t*w^2-s*w^3+3*s*w*t^2-0.9563453
where,
p = [-0.1, 0.4], *q* = [0.4, 1], *r* = [-0.7,-0.4], *s* = [-0.7, 0.4],
t = [0.1, 0.2], *u* = [-0.1, 0.2], *v* = [-0.3, 1.1], *w* = [-1.1,-0.3]

zcap =
- 1.7434486
Lsol =

    0.4   0.4
    0.4   0.4
  - 0.7   - 0.7
  - 0.7   - 0.7
    0.1   0.1
  - 0.0789063 - 0.0789063
  - 0.3   - 0.3
  - 1.1   - 1.1

10) Reim 5: The 5-dimensional system of Reimer,
f(p,q,r,s,t) = -1+2*p^6-2*q^6+2*r^6-2*s^6+2*t^6
p,q,r,s,t=[-1,1]

zcap =

  - 5.
Lsol =

       Lsol(1)

    0.   0.
  - 1. - 1.
    0.   0.
  - 1. - 1.
    0.   0.

Lsol(2)

```
   0.   0.
 - 1. - 1.
   0.   0.
   1.   1.
   0.   0.
```

Lsol(3)

```
   0.   0.
   1.   1.
   0.   0.
 - 1. - 1.
   0.   0.
```

Lsol(4)

```
   0.   0.
   1.   1.
   0.   0.
   1.   1.
   0.   0.
```

11) Hun 5 : The 5-dimensional Hunecke,
f(p,q,r,s,t) =
q^6*r+q*r^6+p^2*q^4*t-3*p*q^2*r^2*s*t+r^4*s^2*t+r^4*s^2*t-p^3*r*s*t^2-p*q*s^3*t^2+q*r*t^5

p = [0, 1], q= [2, 3], r = [-2,-1], s = [1, 3], t = [-2,-1]

zcap =

```
 - 1436.5151
```
Lsol =

```
   0.          0.
   3.          3.
 - 2.        - 2.
   3.          3.
 - 1.4802246 - 1.4802246
```

12) Cyc 5 : The cyclic 5-roots problem,
f(p,q,r,s,t) = p*q*r*s+p*q*r*t+p*q*s*t+p*q*r*t+p*r*s*t+q*r*s*t

p,q,r,s,t = [-10, 10],

zcap =

```
 - 40000.
```

Lsol =

    Lsol(1)

- 10. - 10.
- 10. - 10.
- 10. - 10.
- 10. - 10.
  10.   10.

    Lsol(2)

- 10. - 10.
- 10. - 10.
  10.   10.
- 10. - 10.
- 10. - 10.

    Lsol(3)

- 10. - 10.
  10.   10.
- 10. - 10.
- 10. - 10.
- 10. - 10.

    Lsol(4)

- 10. - 10.
  10.   10.
  10.   10.
  10.   10.
  10.   10.

    Lsol(5)

  10.   10.
- 10. - 10.
- 10. - 10.
- 10. - 10.
- 10. - 10.

    Lsol(6)

  10.   10.
- 10. - 10.
  10.   10.
  10.   10.

10.   10.

  Lsol(7)

  10.   10.
  10.   10.
- 10. - 10.
  10.   10.
  10.   10.

  Lsol(8)

  10.   10.
  10.   10.
  10.   10.
  10.   10.
- 10. - 10.

13) Mag 6 : A problem of magnetism in physics,
f(p,q,r,s,t,u) = 2*p^2+2*q^2+2*r^2+2*s^2+2*t^2+u^2-u

p,q,r,s,t,u = [-5, 5],

ActSubD =

  0.
 zcap =

 - 0.25
 Lsol =

  0.   0.
  0.   0.
  0.   0.
  0.   0.
  0.   0.
  0.5004883   0.5004883

14) Hair 6 : Hairer,
f(p,q,r,s,t,u) = r^3*s+q^3*t+p^3*u-0.25
p = [2, 5], q = [2, 5], r = [2, 5], s = [-5,-2], t = [-5,-2], u = [-5,-2]

zcap =

 - 1875.25
 Lsol =

  5.   5.
  5.   5.

```
   5.   5.
 - 5.  - 5.
 - 5.  - 5.
 - 5.  - 5.
```

15) C.D. 6 : Camera displacement between two positions, scaled first frame,
f(p,q,r,s,t,u) = -6.8*p*s-3.2*p*t+1.3*p*u+5.1*p-3.2*r*s-4.8*q*t-0.7*q*u-7.1*q+1.3*r*s-0.7*r*t+9.0*r*u-r+5.1*s-7.1*t-u+2.6

p,q,r,s,t,u = [-100, 100],

zcap =

 - 270397.4
 Lsol =

```
   100.   100.
   100.   100.
   100.   100.
   100.   100.
   100.   100.
 - 100.  - 100.
```