

CG Tutorial - 4

1. (a) $E_n = 10; \quad \sigma_g = 8$
 $(x_n, y_n) = (0, 1)$
 $(x_0, y_0) = (0, x_g) = (0, 8)$
 $P_{10} = \sigma_g^2 - x_n^2 \sigma_g + \frac{1}{4} x_n^2$
 $= 64 - 100 \times 8 + \frac{1}{4} \times 100$
 $= -211$

$P_{10} < 0$

$\therefore (x_1, y_1) = (1, 8)$

$P_{11} = P_{10} + 2 \sigma_g^2 x_n + 3 x_n^2$
 $= -391$

$P_{11} < 0$

$\therefore (x_2, y_2) = (2, 8)$

$P_{12} = P_{11} + 2 \sigma_g^2 x_{11} + 3 x_{11}^2$
 $= 59$

k	P_{1k}	(x_{k+1}, y_{k+1})	$2 \times \sigma_g^2 \times x_{k+1}$	$2 \times \sigma_g^2 \times y_{k+1}$
0	-211	(1, 8)	128	1600
1	-391	(2, 8)	128	1600
2	59	(3, 8)	384	1400
3	-517	(4, 8)	812	1400
4	137	(5, 8)	640	1200
5	-31	(6, 8)	768	1200
6	929	(7, 8)	896	1000
7	1217	(8, 8)	1024	800

Region 2:

$P_{20} = \sigma_g^2 (x_n + 1)^2 - x_n^2 (y_0 - 1) - x_n^2 \sigma_g^2$
 $= -126$

M	P _{2M}	(x _{M+1} , y _{M+1})	2x _{M+1} ²	2x _{M+1} y _{M+1}
0	-126	9, 4	1152	800
1	226	9, 3	1152	600
2	-224	10, 2	1280	400
3	256	10, 1	1280	200
4	656	10, 0	1280	0
5	256	10, -1	1280	-200

∴ Points of ellipse in 1st Quad centered on (0,0) are
 (0,5), (1,8), (2,5), (3,8), (4,9), (5,9), (6,6), (7,4), (8,5),
 (9,9), (9,5), (10,2), (10,1), (10,0)

To get remaining points we used symmetry

To get the points also centered on (C_x, C_y) we perform

$$x' = x + C_x$$

$$y' = y + C_y$$

$$\forall (x, y)$$

1. ⑤ $r_x = 8, r_y = 10$

$$(x_0, y_0) = (0, 10)$$

Region 1

$$P_{10} = r_y^2 + r_x^2 r_y + \frac{1}{4} r_x^2$$

$$= -524$$

P ₁	P _{1K}	x _{M+1} , y _{M+1}	2x _{M+1} ²	2x _{M+1} y _{M+1}
0	-524	1, 10	200	1280
1	-224	2, 10	400	1280
2	226	3, 9	600	1152
3	-126	4, 9	800	1152
4	224	5, 8	1000	1024
5	200	6, 9	1200	896

Region 2

$$P_{20} = p_g^2 (n_0 + 6.5)^2 - r_n^2 (y_0 - 1)^2 - r_n^2 p_g^2$$

$$= 129$$

K	P _{2U}	n _{U+1} , y _{U+1}	2 r _g ² n _{U+1}	2 n _U ² y _{U+1}
0	129	6.6	1200	868
1	-576	7.5	1400	640
2	249	7.4	1400	512
3	-199	8.3	1600	384
4	1081	8.2	1600	286
5	884	8.1	1600	128
6	825	8.0	1600	0
7	889	8, -1	1600	-128

The points of remaining grandraints are obtained using symmetry.