NTTRU Estimation

Estimate the drop of bit security caused by multiple information leaked from power side channel.

```
load("../framework/instance_gen.sage")
```

```
## NTRU instance initilizaiton


n = 768
m = n
q = 7681

D_e = {-1: 5/16, 0:6/16, 1:5/16}
D_s = D_e
#number of one in f and g In NTTRU , the distribution of -1,0,1 is 5/16,
6/16,6/16
# Dg = int(round(6*n/16))
# Df = Dg
bit_security_constant = 0.292

# A, b, dbdd = initialize_NTRU_instance(DBDD_predict, n, q, Df, Dg, verbosity=0)
A, b, dbdd = initialize_from_LWE_instance(DBDD_predict, n, q, m, D_e,D_s)
```

```
•[4;37m      Build DBDD from LWE      •[Om
•[1;33m n=768    m=768    q=7681 •[Om
```

```
s_key = []

for i in range(n):
    v0 = [0 for i in range(m + n)]
    v0[i]=1
    s_key.append(dbdd.leak(v0))
```

```
## NTT initialization
```

```
bit_reverse_tree = [1, 128, 64, 320, 32, 224, 160, 352, 16, 208, 112, 304, 80,
272, 176, 368, 8, 200, 104, 296, 56, 248, 152, 344, 40, 232, 136, 328, 88, 280,
184, 376, 4, 196, 100, 292, 52, 244, 148, 340, 28, 220, 124, 316, 76, 268, 172,
364, 20, 212, 116, 308, 68, 260, 164, 356, 44, 236, 140, 332, 92, 284, 188, 380,
2, 194, 98, 290, 50, 242, 146, 338, 26, 218, 122, 314, 74, 266, 170, 362, 14,
206, 110, 302, 62, 254, 158, 350, 38, 230, 134, 326, 86, 278, 182, 374, 10, 202,
106, 298, 58, 250, 154, 346, 34, 226, 130, 322, 82, 274, 178, 370, 22, 214, 118,
310, 70, 262, 166, 358, 46, 238, 142, 334, 94, 286, 190, 382, 1, 193, 97, 289,
49, 241, 145, 337, 25, 217, 121, 313, 73, 265, 169, 361, 13, 205, 109, 301, 61,
253, 157, 349, 37, 229, 133, 325, 85, 277, 181, 373, 7, 199, 103, 295, 55, 247,
151, 343, 31, 223, 127, 319, 79, 271, 175, 367, 19, 211, 115, 307, 67, 259, 163,
355, 43, 235, 139, 331, 91, 283, 187, 379, 5, 197, 101, 293, 53, 245, 149, 341,
29, 221, 125, 317, 77, 269, 173, 365, 17, 209, 113, 305, 65, 257, 161, 353, 41,
233, 137, 329, 89, 281, 185, 377, 11, 203, 107, 299, 59, 251, 155, 347, 35, 227,
131, 323, 83, 275, 179, 371, 23, 215, 119, 311, 71, 263, 167, 359, 47, 239, 143,
335, 95, 287, 191, 383]
R = IntegerModRing(q)
V = VectorSpace(R,n)

import numpy as np

# def bit_reverse(x):return int( "0b" + bin(x)[2:].rjust(8,'0')[::-1] ,2)+1
def bit_reverse(x): return bit_reverse_tree[x]
NTT_matrix = []

def add (x,y) : return x +y
zetas=
[-7661,7661,-6212,6212,-6464,6464,7586,-7586,4822,-4822,1618,-1618,3845,-3845,-37
02,3702,4277,-4277,1913,-1913,3326,-3326,-6874,6874,-3446,3446,5741,-5741,-1534,1
534,-2834,2834,1081,-1081,-867,867,5483,-5483,626,-626,-1293,1293,3730,-3730,-148
5,1485,-7300,7300,1894,-1894,6233,-6233,803,-803,-5156,5156,-7289,7289,-5004,5004
,-726,726,5819,-5819,-245,245,-713,713,-5307,5307,3084,-3084,-1462,1462,7063,-706
3,-6776,6776,3104,-3104,3294,-3294,-6152,6152,1502,-1502,-4125,4125,-32,32,722,-7
22,7270,-7270,-7529,7529,4040,-4040,-2821,2821,42,-42,-3828,3828,6238,-6238,4234,
-4234,-6772,6772,-2747,2747,-3999,3999,-5305,5305,-4076,4076,-5968,5968,2879,-287
9,-149,149,5053,-5053,-4074,4074,-2977,2977,1400,-1400,6650,-6650,699,-699,1955,-
1955,7257,-7257,5667,-5667,-7366,7366,4348,-4348,7512,-7512,-2723,2723,2390,-2390
,-2458,2458,4572,-4572,6355,-6355,-7527,7527,-758,758,6541,-6541,2266,-2266,7441,
-7441,-7627,7627,-6019,6019,-3627,3627,-4097,4097,1507,-1507,2003,-2003,-87,87,24
43,-2443,-3046,3046,4397,-4397,-237,237,2947,-2947,3824,-3824,5893,-5893,-812,812
,-2802,2802,-2826,2826,5194,-5194,-2212,2212,1902,-1902,504,-504,-7531,7531,4553,
-4553,-2394,2394,3227,-3227,-2240,2240,4722,-4722,-5727,5727,-2236,2236,-1397,139
7,6806,-6806,-4741,4741,-4502,4502,6524,-6524,265,-265,2182,-2182,-5019,5019,-341
4,3414,2986,-2986,6558,-6558,2749,-2749,-5857,5857,983,-983,384,-384]
def modular_exponentiation(base, exponent, modulus):
    result = 1
    base = base % modulus  # 确保基数在模数范围内
    while exponent > 0:
        if (exponent % 2) == 1:  # 如果指数为奇数
            result = (result * base) % modulus
        exponent //= 2  # 指数除以2
        base = (base * base) % modulus  # 基数平方
    return result


for x in range(n/3):
```

```
    NTT_matrix.append(V(reduce(add,
[[modular_exponentiation(zetas[i],x,7681),0,0] for i in range(n/3)])))
    NTT_matrix.append(V(reduce(add,
[[0,modular_exponentiation(zetas[i],x,7681),0] for i in range(n/3)])))
    NTT_matrix.append(V(reduce(add,
[[0,0,modular_exponentiation(zetas[i],x,7681)] for i in range(n/3)])))

NTT_matrix = matrix(NTT_matrix)
```

```
#获得s_hat
s_hat_list = V(s_key)*NTT_matrix

#逆NTT过程最下面一层的zeta
zetas=
[-7661,7661,-6212,6212,-6464,6464,7586,-7586,4822,-4822,1618,-1618,3845,-3845,-37
02,3702,4277,-4277,1913,-1913,3326,-3326,-6874,6874,-3446,3446,5741,-5741,-1534,1
534,-2834,2834,1081,-1081,-867,867,5483,-5483,626,-626,-1293,1293,3730,-3730,-148
5,1485,-7300,7300,1894,-1894,6233,-6233,803,-803,-5156,5156,-7289,7289,-5004,5004
,-726,726,5819,-5819,-245,245,-713,713,-5307,5307,3084,-3084,-1462,1462,7063,-706
3,-6776,6776,3104,-3104,3294,-3294,-6152,6152,1502,-1502,-4125,4125,-32,32,722,-7
22,7270,-7270,-7529,7529,4040,-4040,-2821,2821,42,-42,-3828,3828,6238,-6238,4234,
-4234,-6772,6772,-2747,2747,-3999,3999,-5305,5305,-4076,4076,-5968,5968,2879,-287
9,-149,149,5053,-5053,-4074,4074,-2977,2977,1400,-1400,6650,-6650,699,-699,1955,-
1955,7257,-7257,5667,-5667,-7366,7366,4348,-4348,7512,-7512,-2723,2723,2390,-2390
,-2458,2458,4572,-4572,6355,-6355,-7527,7527,-758,758,6541,-6541,2266,-2266,7441,
-7441,-7627,7627,-6019,6019,-3627,3627,-4097,4097,1507,-1507,2003,-2003,-87,87,24
43,-2443,-3046,3046,4397,-4397,-237,237,2947,-2947,3824,-3824,5893,-5893,-812,812
,-2802,2802,-2826,2826,5194,-5194,-2212,2212,1902,-1902,504,-504,-7531,7531,4553,
-4553,-2394,2394,3227,-3227,-2240,2240,4722,-4722,-5727,5727,-2236,2236,-1397,139
7,6806,-6806,-4741,4741,-4502,4502,6524,-6524,265,-265,2182,-2182,-5019,5019,-341
4,3414,2986,-2986,6558,-6558,2749,-2749,-5857,5857,983,-983,384,-384]
```

```
v_list = []

# 获得nums_z

# 定义列表 z，长度为 256
nums_z = []*256

# 求解 nums_z 列表
for i in range(256):
    term1 = s_hat_list[3 * i]          # f[3*i]
    term2 = s_hat_list[3 * i + 1]      # f[3*i+1]
    term3 = s_hat_list[3 * i + 2]      # f[3*i+2]

    z_i = 0 if R(term1) == 0 else R(-term2 - term3) / R(term1)
    # z_i=R(-term2-term3)/R(term1)

    # 将 z[i] 转换为 R 上的元素
    z_i = R(z_i)

    nums_z.append(z_i)
```

```
# 整合yu的hints
for i in range(256):

 v=nums_z[i]*NTT_matrix.column(3*i)+NTT_matrix.column(3*i+1)+NTT_matrix.column(3*
i+2)
    v=list(v)
    v_prime = [int(i) for i in list(v)] + [0]*768
    v_list.append(vec(v_prime))
```

```
 for v_0 in v_list:
    a=dbdd.leak(v_0)%7681
    #如果R(term1) == 0或者R(temp0)==0  其对应的hint不合法，跳过改hint
    if(a!=0):
        continue
    dbdd.integrate_modular_hint(v_0,0,7681,True)
```

```
•[1;37m integrate modular hint •[0m •[0m (smooth) •[0m •[3;32m   Worthy hint !
•[0m •[1;33m dim=1537, δ=1.00327470, β=527.88 •[0m
•[1;37m integrate modular hint •[0m •[0m (smooth) •[0m •[3;32m   Worthy hint !
•[0m •[1;33m dim=1537, δ=1.00327850, β=527.13 •[0m
•[1;37m integrate modular hint •[0m •[0m (smooth) •[0m •[3;32m   Worthy hint !
•[0m •[1;33m dim=1537, δ=1.00328170, β=526.38 •[0m
•[1;37m integrate modular hint •[0m •[0m (smooth) •[0m •[3;32m   Worthy hint !
•[0m •[1;33m dim=1537, δ=1.00328490, β=525.63 •[0m
•[1;37m integrate modular hint •[0m •[0m (smooth) •[0m •[3;32m   Worthy hint !
•[0m •[1;33m dim=1537, δ=1.00328809, β=524.88 •[0m
•[1;37m integrate modular hint •[0m •[0m (smooth) •[0m •[3;32m   Worthy hint !
•[0m •[1;33m dim=1537, δ=1.00329189, β=524.13 •[0m
•[1;37m integrate modular hint •[0m •[0m (smooth) •[0m •[3;32m   Worthy hint !
•[0m •[1;33m dim=1537, δ=1.00329509, β=523.39 •[0m
•[1;37m integrate modular hint •[0m •[0m (smooth) •[0m •[3;32m   Worthy hint !
•[0m •[1;33m dim=1537, δ=1.00329828, β=522.65 •[0m
•[1;37m integrate modular hint •[0m •[0m (smooth) •[0m •[3;32m   Worthy hint !
•[0m •[1;33m dim=1537, δ=1.00330148, β=521.91 •[0m
•[1;37m integrate modular hint •[0m •[0m (smooth) •[0m •[3;32m   Worthy hint !
•[0m •[1;33m dim=1537, δ=1.00330528, β=521.17 •[0m
•[1;37m integrate modular hint •[0m •[0m (smooth) •[0m •[3;32m   Worthy hint !
•[0m •[1;33m dim=1537, δ=1.00330847, β=520.43 •[0m
•[1;37m integrate modular hint •[0m •[0m (smooth) •[0m •[3;32m   Worthy hint !
•[0m •[1;33m dim=1537, δ=1.00331166, β=519.69 •[0m
•[1;37m integrate modular hint •[0m •[0m (smooth) •[0m •[3;32m   Worthy hint !
•[0m •[1;33m dim=1537, δ=1.00331485, β=518.96 •[0m
•[1;37m integrate modular hint •[0m •[0m (smooth) •[0m •[3;32m   Worthy hint !
•[0m •[1;33m dim=1537, δ=1.00331865, β=518.23 •[0m
•[1;37m integrate modular hint •[0m •[0m (smooth) •[0m •[3;32m   Worthy hint !
•[0m •[1;33m dim=1537, δ=1.00332184, β=517.49 •[0m
•[1;37m integrate modular hint •[0m •[0m (smooth) •[0m •[3;32m   Worthy hint !
•[0m •[1;33m dim=1537, δ=1.00332502, β=516.76 •[0m
•[1;37m integrate modular hint •[0m •[0m (smooth) •[0m •[3;32m   Worthy hint !
•[0m •[1;33m dim=1537, δ=1.00332882, β=516.04 •[0m
•[1;37m integrate modular hint •[0m •[0m (smooth) •[0m •[3;32m   Worthy hint !
•[0m •[1;33m dim=1537, δ=1.00333201, β=515.31 •[0m
```

```
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00333520, β=514.58 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00333838, β=513.86 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00334218, β=513.14 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00334536, β=512.42 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00334854, β=511.70 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00335173, β=510.98 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00335552, β=510.26 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00335870, β=509.55 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00336188, β=508.84 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00336568, β=508.13 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00336886, β=507.42 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00337204, β=506.71 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00337584, β=506.00 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00337901, β=505.30 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00338218, β=504.59 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00338536, β=503.89 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00338916, β=503.19 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00339233, β=502.49 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00339550, β=501.79 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00339930, β=501.10 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00340247, β=500.40 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00340563, β=499.71 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00340943, β=499.02 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00341260, β=498.32 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00341576, β=497.64 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00341893, β=496.95 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00342273, β=496.26 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00342589, β=495.58 •[Om
```

•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00342905, β=494.89 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00343285, β=494.21 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00343601, β=493.53 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00343917, β=492.85 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00344297, β=492.18 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00344613, β=491.50 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00344929, β=490.82 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00345309, β=490.15 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00345624, β=489.48 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00345939, β=488.81 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00346320, β=488.14 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00346635, β=487.47 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00346950, β=486.81 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00347330, β=486.14 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00347645, β=485.48 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00347960, β=484.82 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00348340, β=484.16 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00348655, β=483.50 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00348969, β=482.84 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00349349, β=482.18 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00349664, β=481.53 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00349978, β=480.87 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00350358, β=480.22 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00350672, β=479.57 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00350986, β=478.92 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00351366, β=478.27 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00351680, β=477.62 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00351994, β=476.98 •[Om

•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00352374, β=476.33 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00352688, β=475.69 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00353068, β=475.05 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00353382, β=474.41 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00353695, β=473.77 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00354075, β=473.13 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00354388, β=472.49 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00354701, β=471.86 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00355081, β=471.22 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00355395, β=470.59 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00355707, β=469.96 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00356087, β=469.33 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00356400, β=468.70 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00356780, β=468.07 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00357405, β=466.82 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00357785, β=466.20 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00358098, β=465.57 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00358410, β=464.95 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00358790, β=464.33 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00359102, β=463.71 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00359482, β=463.10 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00360486, β=461.25 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00361177, β=460.03 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00361489, β=459.42 •[Om

•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00361800, β=458.81 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00362180, β=458.20 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00362492, β=457.60 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00365566, β=452.19 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00366566, β=450.41 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00370634, β=443.40 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00370943, β=442.82 •[Om

•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00371323, β=442.25 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00372320, β=440.53 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00372629, β=439.95 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00373009, β=439.38 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00373317, β=438.82 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00373697, β=438.25 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00374005, β=437.68 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[Om •[1;33m dim=1537, δ=1.00386902, β=416.94 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
•[Om •[1;33m dim=1537, δ=1.00390323, β=411.72 •[Om
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
•[Om •[1;33m dim=1537, δ=1.00393058, β=407.62 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
•[Om •[1;33m dim=1537, δ=1.00393438, β=407.11 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
•[Om •[1;33m dim=1537, δ=1.00394804, β=405.09 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
•[Om •[1;33m dim=1537, δ=1.00395487, β=404.08 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
•[Om •[1;33m dim=1537, δ=1.00395789, β=403.58 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
•[Om •[1;33m dim=1537, δ=1.00396169, β=403.08 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
•[Om •[1;33m dim=1537, δ=1.00396471, β=402.58 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
•[Om •[1;33m dim=1537, δ=1.00396852, β=402.08 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
•[Om •[1;33m dim=1537, δ=1.00397154, β=401.59 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
•[Om •[1;33m dim=1537, δ=1.00397534, β=401.09 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m worthy hint !
•[Om •[1;33m dim=1537, δ=1.00399579, β=398.13 •[Om

•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[Om •[1;33m dim=1537, δ=1.00400942, β=396.17 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
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•[Om •[1;33m dim=1537, δ=1.00408804, β=385.20 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00409102, β=384.73 •[Om

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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00409483, β=384.26 •[Om
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•[Om •[1;33m dim=1537, δ=1.00410161, β=383.33 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00410460, β=382.87 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00410840, β=382.41 •[Om
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
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•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00412577, β=380.11 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00412874, β=379.65 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00413255, β=379.19 •[Om
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•[Om •[1;33m dim=1537, δ=1.00413552, β=378.74 •[Om
•[1;37m integrate modular hint •[Om •[Om (smooth) •[Om •[3;32m   Worthy hint !
•[Om •[1;33m dim=1537, δ=1.00413932, β=378.28 •[Om
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