

Gradient_descent

January 31, 2020

1 Steepest descent

```
[106]: using Plots, ForwardDiff, Interact, Printf, LinearAlgebra
```

2 Steepest descent on quadratic with exact linesearch

```
[132]: #f(x) = 1/2 x'Ax + b'x (ignoring constant terms)
function grad_method_exact_ls(A, b, x0, =1e-6)
    x = copy(x0)
    f = A*x + b
    k = 0
    xtrace = x'
    while norm(f) >
        = dot(f, f) / dot(f, A*f)
        x = x - * f
        f = A*x + b
        f = (1/2)x'*A*x + b'*x
        @printf "it = %3d | |f| = %8.2e | f = %8.2e\n" k norm(f) f
        k += 1
        xtrace = vcat(xtrace, x')
    end
    return xtrace
end
```

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[132]: grad_method_exact_ls (generic function with 2 methods)
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```
[133]: #Apply to f(x) = x^2+2y^2
A = [1 0; 0 2]
b = [0, 0]
x0 = [2, 1]
xtrace = grad_method_exact_ls(A, b, x0);
```

```
it = 0 | |f| = 9.43e-01 | f = 3.33e-01
it = 1 | |f| = 3.14e-01 | f = 3.70e-02
it = 2 | |f| = 1.05e-01 | f = 4.12e-03
it = 3 | |f| = 3.49e-02 | f = 4.57e-04
it = 4 | |f| = 1.16e-02 | f = 5.08e-05
```

```

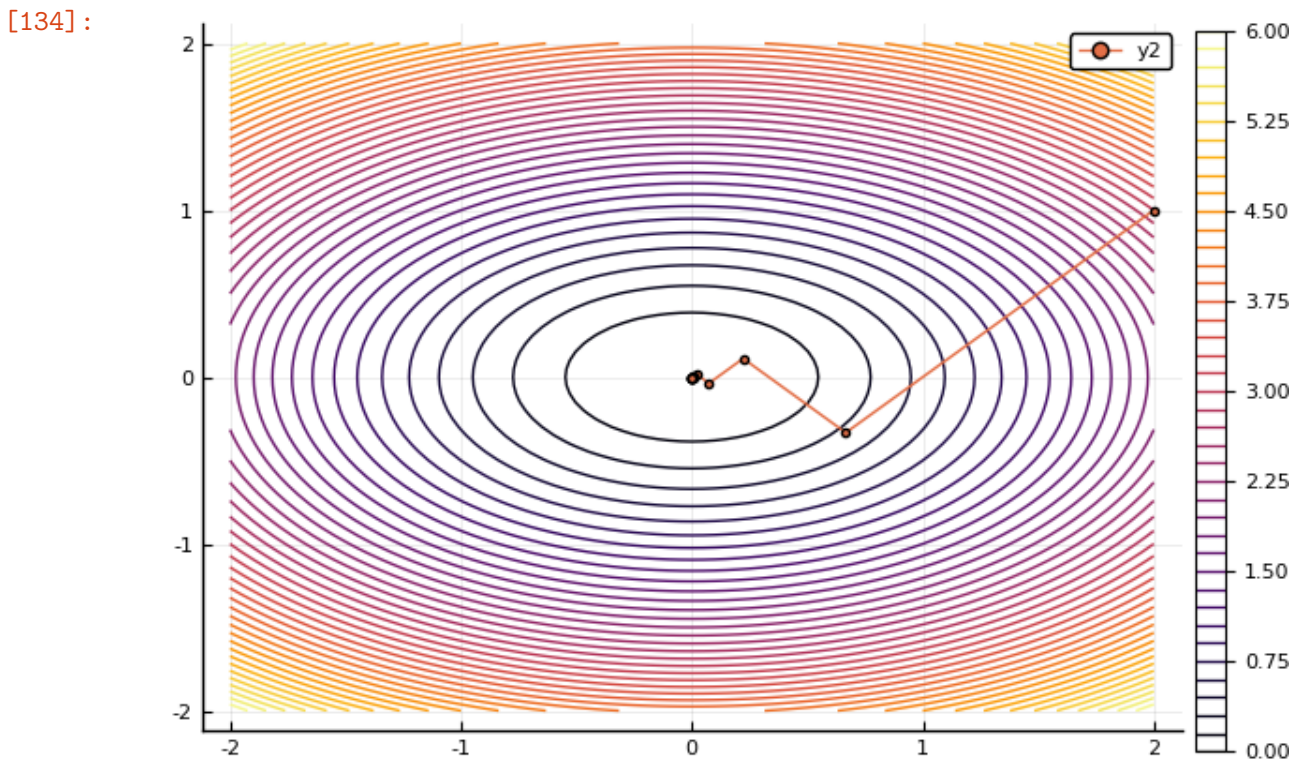
it = 5 | |f| = 3.88e-03 | f = 5.65e-06
it = 6 | |f| = 1.29e-03 | f = 6.27e-07
it = 7 | |f| = 4.31e-04 | f = 6.97e-08
it = 8 | |f| = 1.44e-04 | f = 7.74e-09
it = 9 | |f| = 4.79e-05 | f = 8.60e-10
it = 10 | |f| = 1.60e-05 | f = 9.56e-11
it = 11 | |f| = 5.32e-06 | f = 1.06e-11
it = 12 | |f| = 1.77e-06 | f = 1.18e-12
it = 13 | |f| = 5.91e-07 | f = 1.31e-13

```

```

[134]: f(x1,x2) = (1/2)*[x1;x2]'*A*[x1;x2] + b'*[x1;x2]
x1 = -2:0.05:2
x2 = -2:0.05:2;
contour(x1, x2, f, levels = 50)
plot!(xtrace[:,1],xtrace[:,2],marker = 3)

```



3 Gradient method with backtracking linesearch

```

[141]: function grad_method_backtracking(fObj, gObj, x0;  = 1e-6,  = 1e-5, maxits = 1000)
    x = copy(x0)
    f = fObj(x)

```

```

    f = gObj(x)
    k = 0
    xtrace = x'
    while norm(f) > 1.0 && k < maxits
        while ((f - fObj(x - * f)) < *dot(f, f) )
            /=2
        end
        x = x - * f
        f = fObj(x)
        f = gObj(x)
        @printf "it = %3d | |f| = %8.2e | f = %8.2e\n" k norm(f) f
        k += 1
        xtrace = vcat(xtrace, x')
    end
    return x, xtrace
end

```

[141]: grad_method_backtracking (generic function with 1 method)

```

[142]: #Apply to  $f(x) = x^2 + 2y^2$ 
A = [1 0; 0 2]
b = [0, 0]
x0 = [2, 1]
f(x) = x'*A*x + b'*x
f(x) = A*x + b
x, xtrace = grad_method_backtracking(f, f, x0);

f(x1,x2) = x1^2 + 2x2^2
x1 = -2:0.05:2
x2 = -2:0.05:2
contour(x1, x2, f, levels = 50)
plot!(xtrace[:,1],xtrace[:,2],marker = 3)

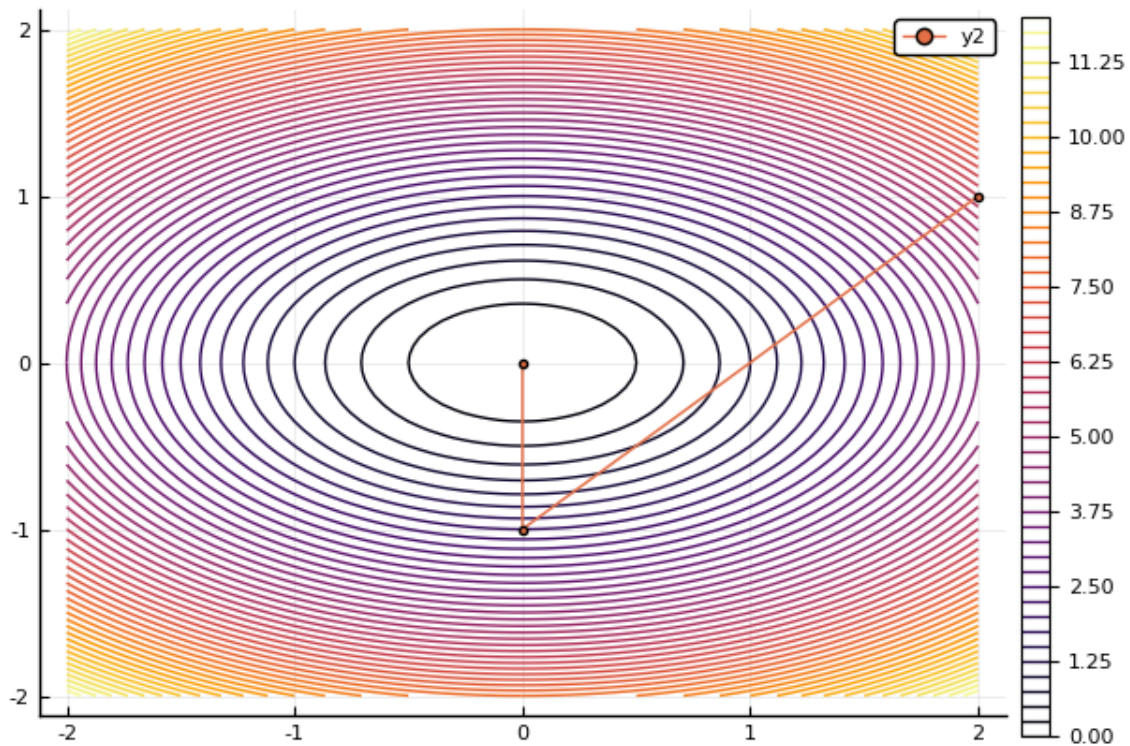
```

```

it = 0 | |f| = 2.00e+00 | f = 2.00e+00
it = 1 | |f| = 0.00e+00 | f = 0.00e+00

```

[142]:



```
[143]: #Apply to  $f(x) = x^2 + y^2/100$ 
A = [1 0; 0 1/100]
b = [0, 0]
x0 = [2 ,1]
f(x) = x'*A*x + b'*x
f(x) = A*x + b
x, xtrace = grad_method_backtracking(f, f, x0, = 1e-1);
```

```
it = 0 | |f| = 9.90e-03 | f = 9.80e-03
it = 1 | |f| = 9.80e-03 | f = 9.61e-03
it = 2 | |f| = 9.70e-03 | f = 9.41e-03
it = 3 | |f| = 9.61e-03 | f = 9.23e-03
it = 4 | |f| = 9.51e-03 | f = 9.04e-03
it = 5 | |f| = 9.41e-03 | f = 8.86e-03
it = 6 | |f| = 9.32e-03 | f = 8.69e-03
it = 7 | |f| = 9.23e-03 | f = 8.51e-03
it = 8 | |f| = 9.14e-03 | f = 8.35e-03
it = 9 | |f| = 9.04e-03 | f = 8.18e-03
it = 10 | |f| = 8.95e-03 | f = 8.02e-03
it = 11 | |f| = 8.86e-03 | f = 7.86e-03
it = 12 | |f| = 8.78e-03 | f = 7.70e-03
it = 13 | |f| = 8.69e-03 | f = 7.55e-03
it = 14 | |f| = 8.60e-03 | f = 7.40e-03
it = 15 | |f| = 8.51e-03 | f = 7.25e-03
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it = 16 | | f| = 8.43e-03 | f = 7.11e-03
it = 17 | | f| = 8.35e-03 | f = 6.96e-03
it = 18 | | f| = 8.26e-03 | f = 6.83e-03
it = 19 | | f| = 8.18e-03 | f = 6.69e-03
it = 20 | | f| = 8.10e-03 | f = 6.56e-03
it = 21 | | f| = 8.02e-03 | f = 6.43e-03
it = 22 | | f| = 7.94e-03 | f = 6.30e-03
it = 23 | | f| = 7.86e-03 | f = 6.17e-03
it = 24 | | f| = 7.78e-03 | f = 6.05e-03
it = 25 | | f| = 7.70e-03 | f = 5.93e-03
it = 26 | | f| = 7.62e-03 | f = 5.81e-03
it = 27 | | f| = 7.55e-03 | f = 5.70e-03
it = 28 | | f| = 7.47e-03 | f = 5.58e-03
it = 29 | | f| = 7.40e-03 | f = 5.47e-03
it = 30 | | f| = 7.32e-03 | f = 5.36e-03
it = 31 | | f| = 7.25e-03 | f = 5.26e-03
it = 32 | | f| = 7.18e-03 | f = 5.15e-03
it = 33 | | f| = 7.11e-03 | f = 5.05e-03
it = 34 | | f| = 7.03e-03 | f = 4.95e-03
it = 35 | | f| = 6.96e-03 | f = 4.85e-03
it = 36 | | f| = 6.89e-03 | f = 4.75e-03
it = 37 | | f| = 6.83e-03 | f = 4.66e-03
it = 38 | | f| = 6.76e-03 | f = 4.57e-03
it = 39 | | f| = 6.69e-03 | f = 4.48e-03
it = 40 | | f| = 6.62e-03 | f = 4.39e-03
it = 41 | | f| = 6.56e-03 | f = 4.30e-03
it = 42 | | f| = 6.49e-03 | f = 4.21e-03
it = 43 | | f| = 6.43e-03 | f = 4.13e-03
it = 44 | | f| = 6.36e-03 | f = 4.05e-03
it = 45 | | f| = 6.30e-03 | f = 3.97e-03
it = 46 | | f| = 6.24e-03 | f = 3.89e-03
it = 47 | | f| = 6.17e-03 | f = 3.81e-03
it = 48 | | f| = 6.11e-03 | f = 3.73e-03
it = 49 | | f| = 6.05e-03 | f = 3.66e-03
it = 50 | | f| = 5.99e-03 | f = 3.59e-03
it = 51 | | f| = 5.93e-03 | f = 3.52e-03
it = 52 | | f| = 5.87e-03 | f = 3.45e-03
it = 53 | | f| = 5.81e-03 | f = 3.38e-03
it = 54 | | f| = 5.75e-03 | f = 3.31e-03
it = 55 | | f| = 5.70e-03 | f = 3.24e-03
it = 56 | | f| = 5.64e-03 | f = 3.18e-03
it = 57 | | f| = 5.58e-03 | f = 3.12e-03
it = 58 | | f| = 5.53e-03 | f = 3.05e-03
it = 59 | | f| = 5.47e-03 | f = 2.99e-03
it = 60 | | f| = 5.42e-03 | f = 2.93e-03
it = 61 | | f| = 5.36e-03 | f = 2.88e-03
it = 62 | | f| = 5.31e-03 | f = 2.82e-03
it = 63 | | f| = 5.26e-03 | f = 2.76e-03

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it = 64 | | f| = 5.20e-03 | f = 2.71e-03
it = 65 | | f| = 5.15e-03 | f = 2.65e-03
it = 66 | | f| = 5.10e-03 | f = 2.60e-03
it = 67 | | f| = 5.05e-03 | f = 2.55e-03
it = 68 | | f| = 5.00e-03 | f = 2.50e-03
it = 69 | | f| = 4.95e-03 | f = 2.45e-03
it = 70 | | f| = 4.90e-03 | f = 2.40e-03
it = 71 | | f| = 4.85e-03 | f = 2.35e-03
it = 72 | | f| = 4.80e-03 | f = 2.31e-03
it = 73 | | f| = 4.75e-03 | f = 2.26e-03
it = 74 | | f| = 4.71e-03 | f = 2.21e-03
it = 75 | | f| = 4.66e-03 | f = 2.17e-03
it = 76 | | f| = 4.61e-03 | f = 2.13e-03
it = 77 | | f| = 4.57e-03 | f = 2.08e-03
it = 78 | | f| = 4.52e-03 | f = 2.04e-03
it = 79 | | f| = 4.48e-03 | f = 2.00e-03
it = 80 | | f| = 4.43e-03 | f = 1.96e-03
it = 81 | | f| = 4.39e-03 | f = 1.92e-03
it = 82 | | f| = 4.34e-03 | f = 1.89e-03
it = 83 | | f| = 4.30e-03 | f = 1.85e-03
it = 84 | | f| = 4.26e-03 | f = 1.81e-03
it = 85 | | f| = 4.21e-03 | f = 1.78e-03
it = 86 | | f| = 4.17e-03 | f = 1.74e-03
it = 87 | | f| = 4.13e-03 | f = 1.71e-03
it = 88 | | f| = 4.09e-03 | f = 1.67e-03
it = 89 | | f| = 4.05e-03 | f = 1.64e-03
it = 90 | | f| = 4.01e-03 | f = 1.61e-03
it = 91 | | f| = 3.97e-03 | f = 1.57e-03
it = 92 | | f| = 3.93e-03 | f = 1.54e-03
it = 93 | | f| = 3.89e-03 | f = 1.51e-03
it = 94 | | f| = 3.85e-03 | f = 1.48e-03
it = 95 | | f| = 3.81e-03 | f = 1.45e-03
it = 96 | | f| = 3.77e-03 | f = 1.42e-03
it = 97 | | f| = 3.73e-03 | f = 1.39e-03
it = 98 | | f| = 3.70e-03 | f = 1.37e-03
it = 99 | | f| = 3.66e-03 | f = 1.34e-03
it = 100 | | f| = 3.62e-03 | f = 1.31e-03
it = 101 | | f| = 3.59e-03 | f = 1.29e-03
it = 102 | | f| = 3.55e-03 | f = 1.26e-03
it = 103 | | f| = 3.52e-03 | f = 1.24e-03
it = 104 | | f| = 3.48e-03 | f = 1.21e-03
it = 105 | | f| = 3.45e-03 | f = 1.19e-03
it = 106 | | f| = 3.41e-03 | f = 1.16e-03
it = 107 | | f| = 3.38e-03 | f = 1.14e-03
it = 108 | | f| = 3.34e-03 | f = 1.12e-03
it = 109 | | f| = 3.31e-03 | f = 1.10e-03
it = 110 | | f| = 3.28e-03 | f = 1.07e-03
it = 111 | | f| = 3.24e-03 | f = 1.05e-03

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it = 112 | | f | = 3.21e-03 | f = 1.03e-03
it = 113 | | f | = 3.18e-03 | f = 1.01e-03
it = 114 | | f | = 3.15e-03 | f = 9.91e-04
it = 115 | | f | = 3.12e-03 | f = 9.71e-04
it = 116 | | f | = 3.09e-03 | f = 9.52e-04
it = 117 | | f | = 3.05e-03 | f = 9.33e-04
it = 118 | | f | = 3.02e-03 | f = 9.14e-04
it = 119 | | f | = 2.99e-03 | f = 8.96e-04
it = 120 | | f | = 2.96e-03 | f = 8.78e-04
it = 121 | | f | = 2.93e-03 | f = 8.61e-04
it = 122 | | f | = 2.90e-03 | f = 8.44e-04
it = 123 | | f | = 2.88e-03 | f = 8.27e-04
it = 124 | | f | = 2.85e-03 | f = 8.11e-04
it = 125 | | f | = 2.82e-03 | f = 7.94e-04
it = 126 | | f | = 2.79e-03 | f = 7.79e-04
it = 127 | | f | = 2.76e-03 | f = 7.63e-04
it = 128 | | f | = 2.73e-03 | f = 7.48e-04
it = 129 | | f | = 2.71e-03 | f = 7.33e-04
it = 130 | | f | = 2.68e-03 | f = 7.18e-04
it = 131 | | f | = 2.65e-03 | f = 7.04e-04
it = 132 | | f | = 2.63e-03 | f = 6.90e-04
it = 133 | | f | = 2.60e-03 | f = 6.76e-04
it = 134 | | f | = 2.57e-03 | f = 6.63e-04
it = 135 | | f | = 2.55e-03 | f = 6.50e-04
it = 136 | | f | = 2.52e-03 | f = 6.37e-04
it = 137 | | f | = 2.50e-03 | f = 6.24e-04
it = 138 | | f | = 2.47e-03 | f = 6.12e-04
it = 139 | | f | = 2.45e-03 | f = 6.00e-04
it = 140 | | f | = 2.42e-03 | f = 5.88e-04
it = 141 | | f | = 2.40e-03 | f = 5.76e-04
it = 142 | | f | = 2.38e-03 | f = 5.65e-04
it = 143 | | f | = 2.35e-03 | f = 5.53e-04
it = 144 | | f | = 2.33e-03 | f = 5.42e-04
it = 145 | | f | = 2.31e-03 | f = 5.31e-04
it = 146 | | f | = 2.28e-03 | f = 5.21e-04
it = 147 | | f | = 2.26e-03 | f = 5.11e-04
it = 148 | | f | = 2.24e-03 | f = 5.00e-04
it = 149 | | f | = 2.21e-03 | f = 4.90e-04
it = 150 | | f | = 2.19e-03 | f = 4.81e-04
it = 151 | | f | = 2.17e-03 | f = 4.71e-04
it = 152 | | f | = 2.15e-03 | f = 4.62e-04
it = 153 | | f | = 2.13e-03 | f = 4.53e-04
it = 154 | | f | = 2.11e-03 | f = 4.44e-04
it = 155 | | f | = 2.08e-03 | f = 4.35e-04
it = 156 | | f | = 2.06e-03 | f = 4.26e-04
it = 157 | | f | = 2.04e-03 | f = 4.18e-04
it = 158 | | f | = 2.02e-03 | f = 4.09e-04
it = 159 | | f | = 2.00e-03 | f = 4.01e-04

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it = 160 | | f | = 1.98e-03 | f = 3.93e-04
it = 161 | | f | = 1.96e-03 | f = 3.85e-04
it = 162 | | f | = 1.94e-03 | f = 3.78e-04
it = 163 | | f | = 1.92e-03 | f = 3.70e-04
it = 164 | | f | = 1.90e-03 | f = 3.63e-04
it = 165 | | f | = 1.89e-03 | f = 3.56e-04
it = 166 | | f | = 1.87e-03 | f = 3.48e-04
it = 167 | | f | = 1.85e-03 | f = 3.42e-04
it = 168 | | f | = 1.83e-03 | f = 3.35e-04
it = 169 | | f | = 1.81e-03 | f = 3.28e-04
it = 170 | | f | = 1.79e-03 | f = 3.22e-04
it = 171 | | f | = 1.78e-03 | f = 3.15e-04
it = 172 | | f | = 1.76e-03 | f = 3.09e-04
it = 173 | | f | = 1.74e-03 | f = 3.03e-04
it = 174 | | f | = 1.72e-03 | f = 2.97e-04
it = 175 | | f | = 1.71e-03 | f = 2.91e-04
it = 176 | | f | = 1.69e-03 | f = 2.85e-04
it = 177 | | f | = 1.67e-03 | f = 2.79e-04
it = 178 | | f | = 1.65e-03 | f = 2.74e-04
it = 179 | | f | = 1.64e-03 | f = 2.68e-04
it = 180 | | f | = 1.62e-03 | f = 2.63e-04
it = 181 | | f | = 1.61e-03 | f = 2.58e-04
it = 182 | | f | = 1.59e-03 | f = 2.53e-04
it = 183 | | f | = 1.57e-03 | f = 2.48e-04
it = 184 | | f | = 1.56e-03 | f = 2.43e-04
it = 185 | | f | = 1.54e-03 | f = 2.38e-04
it = 186 | | f | = 1.53e-03 | f = 2.33e-04
it = 187 | | f | = 1.51e-03 | f = 2.28e-04
it = 188 | | f | = 1.50e-03 | f = 2.24e-04
it = 189 | | f | = 1.48e-03 | f = 2.19e-04
it = 190 | | f | = 1.47e-03 | f = 2.15e-04
it = 191 | | f | = 1.45e-03 | f = 2.11e-04
it = 192 | | f | = 1.44e-03 | f = 2.07e-04
it = 193 | | f | = 1.42e-03 | f = 2.03e-04
it = 194 | | f | = 1.41e-03 | f = 1.98e-04
it = 195 | | f | = 1.39e-03 | f = 1.95e-04
it = 196 | | f | = 1.38e-03 | f = 1.91e-04
it = 197 | | f | = 1.37e-03 | f = 1.87e-04
it = 198 | | f | = 1.35e-03 | f = 1.83e-04
it = 199 | | f | = 1.34e-03 | f = 1.80e-04
it = 200 | | f | = 1.33e-03 | f = 1.76e-04
it = 201 | | f | = 1.31e-03 | f = 1.72e-04
it = 202 | | f | = 1.30e-03 | f = 1.69e-04
it = 203 | | f | = 1.29e-03 | f = 1.66e-04
it = 204 | | f | = 1.27e-03 | f = 1.62e-04
it = 205 | | f | = 1.26e-03 | f = 1.59e-04
it = 206 | | f | = 1.25e-03 | f = 1.56e-04
it = 207 | | f | = 1.24e-03 | f = 1.53e-04

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it = 208 | | f | = 1.22e-03 | f = 1.50e-04
it = 209 | | f | = 1.21e-03 | f = 1.47e-04
it = 210 | | f | = 1.20e-03 | f = 1.44e-04
it = 211 | | f | = 1.19e-03 | f = 1.41e-04
it = 212 | | f | = 1.18e-03 | f = 1.38e-04
it = 213 | | f | = 1.16e-03 | f = 1.35e-04
it = 214 | | f | = 1.15e-03 | f = 1.33e-04
it = 215 | | f | = 1.14e-03 | f = 1.30e-04
it = 216 | | f | = 1.13e-03 | f = 1.28e-04
it = 217 | | f | = 1.12e-03 | f = 1.25e-04
it = 218 | | f | = 1.11e-03 | f = 1.23e-04
it = 219 | | f | = 1.10e-03 | f = 1.20e-04
it = 220 | | f | = 1.08e-03 | f = 1.18e-04
it = 221 | | f | = 1.07e-03 | f = 1.15e-04
it = 222 | | f | = 1.06e-03 | f = 1.13e-04
it = 223 | | f | = 1.05e-03 | f = 1.11e-04
it = 224 | | f | = 1.04e-03 | f = 1.09e-04
it = 225 | | f | = 1.03e-03 | f = 1.06e-04
it = 226 | | f | = 1.02e-03 | f = 1.04e-04
it = 227 | | f | = 1.01e-03 | f = 1.02e-04
it = 228 | | f | = 1.00e-03 | f = 1.00e-04
it = 229 | | f | = 9.91e-04 | f = 9.82e-05
it = 230 | | f | = 9.81e-04 | f = 9.63e-05
it = 231 | | f | = 9.71e-04 | f = 9.43e-05
it = 232 | | f | = 9.62e-04 | f = 9.25e-05
it = 233 | | f | = 9.52e-04 | f = 9.06e-05
it = 234 | | f | = 9.42e-04 | f = 8.88e-05
it = 235 | | f | = 9.33e-04 | f = 8.71e-05
it = 236 | | f | = 9.24e-04 | f = 8.53e-05
it = 237 | | f | = 9.14e-04 | f = 8.36e-05
it = 238 | | f | = 9.05e-04 | f = 8.20e-05
it = 239 | | f | = 8.96e-04 | f = 8.03e-05
it = 240 | | f | = 8.87e-04 | f = 7.87e-05
it = 241 | | f | = 8.78e-04 | f = 7.72e-05
it = 242 | | f | = 8.70e-04 | f = 7.56e-05
it = 243 | | f | = 8.61e-04 | f = 7.41e-05
it = 244 | | f | = 8.52e-04 | f = 7.27e-05
it = 245 | | f | = 8.44e-04 | f = 7.12e-05
it = 246 | | f | = 8.35e-04 | f = 6.98e-05
it = 247 | | f | = 8.27e-04 | f = 6.84e-05
it = 248 | | f | = 8.19e-04 | f = 6.70e-05
it = 249 | | f | = 8.11e-04 | f = 6.57e-05
it = 250 | | f | = 8.02e-04 | f = 6.44e-05
it = 251 | | f | = 7.94e-04 | f = 6.31e-05
it = 252 | | f | = 7.87e-04 | f = 6.19e-05
it = 253 | | f | = 7.79e-04 | f = 6.06e-05
it = 254 | | f | = 7.71e-04 | f = 5.94e-05
it = 255 | | f | = 7.63e-04 | f = 5.82e-05

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```

it = 256 | | f | = 7.56e-04 | f = 5.71e-05
it = 257 | | f | = 7.48e-04 | f = 5.59e-05
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it = 262 | | f | = 7.11e-04 | f = 5.06e-05
it = 263 | | f | = 7.04e-04 | f = 4.96e-05
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it = 272 | | f | = 6.43e-04 | f = 4.14e-05
it = 273 | | f | = 6.37e-04 | f = 4.06e-05
it = 274 | | f | = 6.30e-04 | f = 3.98e-05
it = 275 | | f | = 6.24e-04 | f = 3.90e-05
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it = 277 | | f | = 6.12e-04 | f = 3.74e-05
it = 278 | | f | = 6.06e-04 | f = 3.67e-05
it = 279 | | f | = 6.00e-04 | f = 3.60e-05
it = 280 | | f | = 5.94e-04 | f = 3.52e-05
it = 281 | | f | = 5.88e-04 | f = 3.45e-05
it = 282 | | f | = 5.82e-04 | f = 3.38e-05
it = 283 | | f | = 5.76e-04 | f = 3.32e-05
it = 284 | | f | = 5.70e-04 | f = 3.25e-05
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it = 287 | | f | = 5.53e-04 | f = 3.06e-05
it = 288 | | f | = 5.48e-04 | f = 3.00e-05
it = 289 | | f | = 5.42e-04 | f = 2.94e-05
it = 290 | | f | = 5.37e-04 | f = 2.88e-05
it = 291 | | f | = 5.31e-04 | f = 2.82e-05
it = 292 | | f | = 5.26e-04 | f = 2.77e-05
it = 293 | | f | = 5.21e-04 | f = 2.71e-05
it = 294 | | f | = 5.16e-04 | f = 2.66e-05
it = 295 | | f | = 5.11e-04 | f = 2.61e-05
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it = 299 | | f | = 4.90e-04 | f = 2.41e-05
it = 300 | | f | = 4.86e-04 | f = 2.36e-05
it = 301 | | f | = 4.81e-04 | f = 2.31e-05
it = 302 | | f | = 4.76e-04 | f = 2.26e-05
it = 303 | | f | = 4.71e-04 | f = 2.22e-05

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it = 307 | | f | = 4.53e-04 | f = 2.05e-05
it = 308 | | f | = 4.48e-04 | f = 2.01e-05
it = 309 | | f | = 4.44e-04 | f = 1.97e-05
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it = 311 | | f | = 4.35e-04 | f = 1.89e-05
it = 312 | | f | = 4.30e-04 | f = 1.85e-05
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it = 315 | | f | = 4.18e-04 | f = 1.74e-05
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it = 318 | | f | = 4.05e-04 | f = 1.64e-05
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it = 321 | | f | = 3.93e-04 | f = 1.55e-05
it = 322 | | f | = 3.89e-04 | f = 1.51e-05
it = 323 | | f | = 3.85e-04 | f = 1.48e-05
it = 324 | | f | = 3.81e-04 | f = 1.46e-05
it = 325 | | f | = 3.78e-04 | f = 1.43e-05
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it = 328 | | f | = 3.66e-04 | f = 1.34e-05
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it = 332 | | f | = 3.52e-04 | f = 1.24e-05
it = 333 | | f | = 3.48e-04 | f = 1.21e-05
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it = 335 | | f | = 3.42e-04 | f = 1.17e-05
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it = 338 | | f | = 3.31e-04 | f = 1.10e-05
it = 339 | | f | = 3.28e-04 | f = 1.08e-05
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it = 342 | | f | = 3.18e-04 | f = 1.01e-05
it = 343 | | f | = 3.15e-04 | f = 9.93e-06
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it = 347 | | f | = 3.03e-04 | f = 9.16e-06
it = 348 | | f | = 3.00e-04 | f = 8.98e-06
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it = 353 | | f | = 2.85e-04 | f = 8.12e-06
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it = 367 | | f | = 2.48e-04 | f = 6.13e-06
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it = 369 | | f | = 2.43e-04 | f = 5.89e-06
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it = 373 | | f | = 2.33e-04 | f = 5.43e-06
it = 374 | | f | = 2.31e-04 | f = 5.33e-06
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it = 376 | | f | = 2.26e-04 | f = 5.12e-06
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it = 378 | | f | = 2.22e-04 | f = 4.91e-06
it = 379 | | f | = 2.19e-04 | f = 4.82e-06
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it = 384 | | f | = 2.09e-04 | f = 4.36e-06
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it = 386 | | f | = 2.05e-04 | f = 4.18e-06
it = 387 | | f | = 2.03e-04 | f = 4.10e-06
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it = 399 | | f | = 1.80e-04 | f = 3.22e-06

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it = 404 | | f | = 1.71e-04 | f = 2.91e-06
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it = 407 | | f | = 1.66e-04 | f = 2.74e-06
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it = 414 | | f | = 1.54e-04 | f = 2.38e-06
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it = 417 | | f | = 1.50e-04 | f = 2.24e-06
it = 418 | | f | = 1.48e-04 | f = 2.20e-06
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it = 420 | | f | = 1.45e-04 | f = 2.11e-06
it = 421 | | f | = 1.44e-04 | f = 2.07e-06
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it = 423 | | f | = 1.41e-04 | f = 1.99e-06
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it = 440 | | f | = 1.19e-04 | f = 1.41e-06
it = 441 | | f | = 1.18e-04 | f = 1.39e-06
it = 442 | | f | = 1.17e-04 | f = 1.36e-06
it = 443 | | f | = 1.15e-04 | f = 1.33e-06
it = 444 | | f | = 1.14e-04 | f = 1.30e-06
it = 445 | | f | = 1.13e-04 | f = 1.28e-06
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it = 447 | | f | = 1.11e-04 | f = 1.23e-06

it = 448 | | f | = 1.10e-04 | f = 1.20e-06
it = 449 | | f | = 1.09e-04 | f = 1.18e-06
it = 450 | | f | = 1.08e-04 | f = 1.16e-06
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it = 461 | | f | = 9.63e-05 | f = 9.27e-07
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it = 468 | | f | = 8.97e-05 | f = 8.05e-07
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it = 473 | | f | = 8.53e-05 | f = 7.28e-07
it = 474 | | f | = 8.45e-05 | f = 7.14e-07
it = 475 | | f | = 8.36e-05 | f = 6.99e-07
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it = 478 | | f | = 8.11e-05 | f = 6.58e-07
it = 479 | | f | = 8.03e-05 | f = 6.45e-07
it = 480 | | f | = 7.95e-05 | f = 6.32e-07
it = 481 | | f | = 7.87e-05 | f = 6.20e-07
it = 482 | | f | = 7.79e-05 | f = 6.08e-07
it = 483 | | f | = 7.72e-05 | f = 5.95e-07
it = 484 | | f | = 7.64e-05 | f = 5.84e-07
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it = 487 | | f | = 7.41e-05 | f = 5.49e-07
it = 488 | | f | = 7.34e-05 | f = 5.39e-07
it = 489 | | f | = 7.27e-05 | f = 5.28e-07
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it = 492 | | f | = 7.05e-05 | f = 4.97e-07
it = 493 | | f | = 6.98e-05 | f = 4.87e-07
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it = 499 | | f | = 6.57e-05 | f = 4.32e-07
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it = 508 | | f | = 6.00e-05 | f = 3.60e-07
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it = 511 | | f | = 5.82e-05 | f = 3.39e-07
it = 512 | | f | = 5.77e-05 | f = 3.32e-07
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it = 539 | | f | = 4.40e-05 | f = 1.93e-07
it = 540 | | f | = 4.35e-05 | f = 1.89e-07
it = 541 | | f | = 4.31e-05 | f = 1.86e-07
it = 542 | | f | = 4.26e-05 | f = 1.82e-07
it = 543 | | f | = 4.22e-05 | f = 1.78e-07

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it = 550 | | f | = 3.94e-05 | f = 1.55e-07
it = 551 | | f | = 3.90e-05 | f = 1.52e-07
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it = 555 | | f | = 3.74e-05 | f = 1.40e-07
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it = 558 | | f | = 3.63e-05 | f = 1.32e-07
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it = 561 | | f | = 3.52e-05 | f = 1.24e-07
it = 562 | | f | = 3.49e-05 | f = 1.22e-07
it = 563 | | f | = 3.45e-05 | f = 1.19e-07
it = 564 | | f | = 3.42e-05 | f = 1.17e-07
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it = 566 | | f | = 3.35e-05 | f = 1.12e-07
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it = 569 | | f | = 3.25e-05 | f = 1.06e-07
it = 570 | | f | = 3.22e-05 | f = 1.04e-07
it = 571 | | f | = 3.19e-05 | f = 1.02e-07
it = 572 | | f | = 3.15e-05 | f = 9.95e-08
it = 573 | | f | = 3.12e-05 | f = 9.75e-08
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it = 576 | | f | = 3.03e-05 | f = 9.18e-08
it = 577 | | f | = 3.00e-05 | f = 9.00e-08
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it = 579 | | f | = 2.94e-05 | f = 8.65e-08
it = 580 | | f | = 2.91e-05 | f = 8.47e-08
it = 581 | | f | = 2.88e-05 | f = 8.31e-08
it = 582 | | f | = 2.85e-05 | f = 8.14e-08
it = 583 | | f | = 2.82e-05 | f = 7.98e-08
it = 584 | | f | = 2.80e-05 | f = 7.82e-08
it = 585 | | f | = 2.77e-05 | f = 7.66e-08
it = 586 | | f | = 2.74e-05 | f = 7.51e-08
it = 587 | | f | = 2.71e-05 | f = 7.36e-08
it = 588 | | f | = 2.69e-05 | f = 7.22e-08
it = 589 | | f | = 2.66e-05 | f = 7.07e-08
it = 590 | | f | = 2.63e-05 | f = 6.93e-08
it = 591 | | f | = 2.61e-05 | f = 6.79e-08

it = 592 | | f | = 2.58e-05 | f = 6.66e-08
it = 593 | | f | = 2.55e-05 | f = 6.53e-08
it = 594 | | f | = 2.53e-05 | f = 6.40e-08
it = 595 | | f | = 2.50e-05 | f = 6.27e-08
it = 596 | | f | = 2.48e-05 | f = 6.14e-08
it = 597 | | f | = 2.45e-05 | f = 6.02e-08
it = 598 | | f | = 2.43e-05 | f = 5.90e-08
it = 599 | | f | = 2.41e-05 | f = 5.78e-08
it = 600 | | f | = 2.38e-05 | f = 5.67e-08
it = 601 | | f | = 2.36e-05 | f = 5.56e-08
it = 602 | | f | = 2.33e-05 | f = 5.45e-08
it = 603 | | f | = 2.31e-05 | f = 5.34e-08
it = 604 | | f | = 2.29e-05 | f = 5.23e-08
it = 605 | | f | = 2.26e-05 | f = 5.13e-08
it = 606 | | f | = 2.24e-05 | f = 5.02e-08
it = 607 | | f | = 2.22e-05 | f = 4.92e-08
it = 608 | | f | = 2.20e-05 | f = 4.83e-08
it = 609 | | f | = 2.18e-05 | f = 4.73e-08
it = 610 | | f | = 2.15e-05 | f = 4.64e-08
it = 611 | | f | = 2.13e-05 | f = 4.54e-08
it = 612 | | f | = 2.11e-05 | f = 4.45e-08
it = 613 | | f | = 2.09e-05 | f = 4.37e-08
it = 614 | | f | = 2.07e-05 | f = 4.28e-08
it = 615 | | f | = 2.05e-05 | f = 4.19e-08
it = 616 | | f | = 2.03e-05 | f = 4.11e-08
it = 617 | | f | = 2.01e-05 | f = 4.03e-08
it = 618 | | f | = 1.99e-05 | f = 3.95e-08
it = 619 | | f | = 1.97e-05 | f = 3.87e-08
it = 620 | | f | = 1.95e-05 | f = 3.79e-08
it = 621 | | f | = 1.93e-05 | f = 3.72e-08
it = 622 | | f | = 1.91e-05 | f = 3.64e-08
it = 623 | | f | = 1.89e-05 | f = 3.57e-08
it = 624 | | f | = 1.87e-05 | f = 3.50e-08
it = 625 | | f | = 1.85e-05 | f = 3.43e-08
it = 626 | | f | = 1.83e-05 | f = 3.36e-08
it = 627 | | f | = 1.82e-05 | f = 3.29e-08
it = 628 | | f | = 1.80e-05 | f = 3.23e-08
it = 629 | | f | = 1.78e-05 | f = 3.16e-08
it = 630 | | f | = 1.76e-05 | f = 3.10e-08
it = 631 | | f | = 1.74e-05 | f = 3.04e-08
it = 632 | | f | = 1.73e-05 | f = 2.98e-08
it = 633 | | f | = 1.71e-05 | f = 2.92e-08
it = 634 | | f | = 1.69e-05 | f = 2.86e-08
it = 635 | | f | = 1.67e-05 | f = 2.81e-08
it = 636 | | f | = 1.66e-05 | f = 2.75e-08
it = 637 | | f | = 1.64e-05 | f = 2.69e-08
it = 638 | | f | = 1.63e-05 | f = 2.64e-08
it = 639 | | f | = 1.61e-05 | f = 2.59e-08

it = 640 | | f | = 1.59e-05 | f = 2.54e-08
it = 641 | | f | = 1.58e-05 | f = 2.49e-08
it = 642 | | f | = 1.56e-05 | f = 2.44e-08
it = 643 | | f | = 1.55e-05 | f = 2.39e-08
it = 644 | | f | = 1.53e-05 | f = 2.34e-08
it = 645 | | f | = 1.51e-05 | f = 2.29e-08
it = 646 | | f | = 1.50e-05 | f = 2.25e-08
it = 647 | | f | = 1.48e-05 | f = 2.20e-08
it = 648 | | f | = 1.47e-05 | f = 2.16e-08
it = 649 | | f | = 1.46e-05 | f = 2.12e-08
it = 650 | | f | = 1.44e-05 | f = 2.08e-08
it = 651 | | f | = 1.43e-05 | f = 2.03e-08
it = 652 | | f | = 1.41e-05 | f = 1.99e-08
it = 653 | | f | = 1.40e-05 | f = 1.95e-08
it = 654 | | f | = 1.38e-05 | f = 1.91e-08
it = 655 | | f | = 1.37e-05 | f = 1.88e-08
it = 656 | | f | = 1.36e-05 | f = 1.84e-08
it = 657 | | f | = 1.34e-05 | f = 1.80e-08
it = 658 | | f | = 1.33e-05 | f = 1.77e-08
it = 659 | | f | = 1.32e-05 | f = 1.73e-08
it = 660 | | f | = 1.30e-05 | f = 1.70e-08
it = 661 | | f | = 1.29e-05 | f = 1.66e-08
it = 662 | | f | = 1.28e-05 | f = 1.63e-08
it = 663 | | f | = 1.26e-05 | f = 1.60e-08
it = 664 | | f | = 1.25e-05 | f = 1.57e-08
it = 665 | | f | = 1.24e-05 | f = 1.53e-08
it = 666 | | f | = 1.23e-05 | f = 1.50e-08
it = 667 | | f | = 1.21e-05 | f = 1.47e-08
it = 668 | | f | = 1.20e-05 | f = 1.45e-08
it = 669 | | f | = 1.19e-05 | f = 1.42e-08
it = 670 | | f | = 1.18e-05 | f = 1.39e-08
it = 671 | | f | = 1.17e-05 | f = 1.36e-08
it = 672 | | f | = 1.15e-05 | f = 1.33e-08
it = 673 | | f | = 1.14e-05 | f = 1.31e-08
it = 674 | | f | = 1.13e-05 | f = 1.28e-08
it = 675 | | f | = 1.12e-05 | f = 1.26e-08
it = 676 | | f | = 1.11e-05 | f = 1.23e-08
it = 677 | | f | = 1.10e-05 | f = 1.21e-08
it = 678 | | f | = 1.09e-05 | f = 1.18e-08
it = 679 | | f | = 1.08e-05 | f = 1.16e-08
it = 680 | | f | = 1.07e-05 | f = 1.14e-08
it = 681 | | f | = 1.05e-05 | f = 1.11e-08
it = 682 | | f | = 1.04e-05 | f = 1.09e-08
it = 683 | | f | = 1.03e-05 | f = 1.07e-08
it = 684 | | f | = 1.02e-05 | f = 1.05e-08
it = 685 | | f | = 1.01e-05 | f = 1.03e-08
it = 686 | | f | = 1.00e-05 | f = 1.01e-08
it = 687 | | f | = 9.93e-06 | f = 9.86e-09

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it = 688 | | f | = 9.83e-06 | f = 9.67e-09
it = 689 | | f | = 9.73e-06 | f = 9.47e-09
it = 690 | | f | = 9.64e-06 | f = 9.29e-09
it = 691 | | f | = 9.54e-06 | f = 9.10e-09
it = 692 | | f | = 9.44e-06 | f = 8.92e-09
it = 693 | | f | = 9.35e-06 | f = 8.74e-09
it = 694 | | f | = 9.26e-06 | f = 8.57e-09
it = 695 | | f | = 9.16e-06 | f = 8.40e-09
it = 696 | | f | = 9.07e-06 | f = 8.23e-09
it = 697 | | f | = 8.98e-06 | f = 8.07e-09
it = 698 | | f | = 8.89e-06 | f = 7.91e-09
it = 699 | | f | = 8.80e-06 | f = 7.75e-09
it = 700 | | f | = 8.72e-06 | f = 7.60e-09
it = 701 | | f | = 8.63e-06 | f = 7.44e-09
it = 702 | | f | = 8.54e-06 | f = 7.30e-09
it = 703 | | f | = 8.46e-06 | f = 7.15e-09
it = 704 | | f | = 8.37e-06 | f = 7.01e-09
it = 705 | | f | = 8.29e-06 | f = 6.87e-09
it = 706 | | f | = 8.21e-06 | f = 6.73e-09
it = 707 | | f | = 8.12e-06 | f = 6.60e-09
it = 708 | | f | = 8.04e-06 | f = 6.47e-09
it = 709 | | f | = 7.96e-06 | f = 6.34e-09
it = 710 | | f | = 7.88e-06 | f = 6.21e-09
it = 711 | | f | = 7.80e-06 | f = 6.09e-09
it = 712 | | f | = 7.72e-06 | f = 5.97e-09
it = 713 | | f | = 7.65e-06 | f = 5.85e-09
it = 714 | | f | = 7.57e-06 | f = 5.73e-09
it = 715 | | f | = 7.50e-06 | f = 5.62e-09
it = 716 | | f | = 7.42e-06 | f = 5.51e-09
it = 717 | | f | = 7.35e-06 | f = 5.40e-09
it = 718 | | f | = 7.27e-06 | f = 5.29e-09
it = 719 | | f | = 7.20e-06 | f = 5.18e-09
it = 720 | | f | = 7.13e-06 | f = 5.08e-09
it = 721 | | f | = 7.06e-06 | f = 4.98e-09
it = 722 | | f | = 6.99e-06 | f = 4.88e-09
it = 723 | | f | = 6.92e-06 | f = 4.78e-09
it = 724 | | f | = 6.85e-06 | f = 4.69e-09
it = 725 | | f | = 6.78e-06 | f = 4.60e-09
it = 726 | | f | = 6.71e-06 | f = 4.50e-09
it = 727 | | f | = 6.64e-06 | f = 4.41e-09
it = 728 | | f | = 6.58e-06 | f = 4.33e-09
it = 729 | | f | = 6.51e-06 | f = 4.24e-09
it = 730 | | f | = 6.45e-06 | f = 4.16e-09
it = 731 | | f | = 6.38e-06 | f = 4.07e-09
it = 732 | | f | = 6.32e-06 | f = 3.99e-09
it = 733 | | f | = 6.26e-06 | f = 3.91e-09
it = 734 | | f | = 6.19e-06 | f = 3.83e-09
it = 735 | | f | = 6.13e-06 | f = 3.76e-09

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it = 736 | | f | = 6.07e-06 | f = 3.68e-09
it = 737 | | f | = 6.01e-06 | f = 3.61e-09
it = 738 | | f | = 5.95e-06 | f = 3.54e-09
it = 739 | | f | = 5.89e-06 | f = 3.47e-09
it = 740 | | f | = 5.83e-06 | f = 3.40e-09
it = 741 | | f | = 5.77e-06 | f = 3.33e-09
it = 742 | | f | = 5.71e-06 | f = 3.27e-09
it = 743 | | f | = 5.66e-06 | f = 3.20e-09
it = 744 | | f | = 5.60e-06 | f = 3.14e-09
it = 745 | | f | = 5.54e-06 | f = 3.07e-09
it = 746 | | f | = 5.49e-06 | f = 3.01e-09
it = 747 | | f | = 5.43e-06 | f = 2.95e-09
it = 748 | | f | = 5.38e-06 | f = 2.89e-09
it = 749 | | f | = 5.33e-06 | f = 2.84e-09
it = 750 | | f | = 5.27e-06 | f = 2.78e-09
it = 751 | | f | = 5.22e-06 | f = 2.72e-09
it = 752 | | f | = 5.17e-06 | f = 2.67e-09
it = 753 | | f | = 5.12e-06 | f = 2.62e-09
it = 754 | | f | = 5.06e-06 | f = 2.57e-09
it = 755 | | f | = 5.01e-06 | f = 2.51e-09
it = 756 | | f | = 4.96e-06 | f = 2.46e-09
it = 757 | | f | = 4.91e-06 | f = 2.42e-09
it = 758 | | f | = 4.87e-06 | f = 2.37e-09
it = 759 | | f | = 4.82e-06 | f = 2.32e-09
it = 760 | | f | = 4.77e-06 | f = 2.27e-09
it = 761 | | f | = 4.72e-06 | f = 2.23e-09
it = 762 | | f | = 4.67e-06 | f = 2.18e-09
it = 763 | | f | = 4.63e-06 | f = 2.14e-09
it = 764 | | f | = 4.58e-06 | f = 2.10e-09
it = 765 | | f | = 4.53e-06 | f = 2.06e-09
it = 766 | | f | = 4.49e-06 | f = 2.02e-09
it = 767 | | f | = 4.44e-06 | f = 1.98e-09
it = 768 | | f | = 4.40e-06 | f = 1.94e-09
it = 769 | | f | = 4.36e-06 | f = 1.90e-09
it = 770 | | f | = 4.31e-06 | f = 1.86e-09
it = 771 | | f | = 4.27e-06 | f = 1.82e-09
it = 772 | | f | = 4.23e-06 | f = 1.79e-09
it = 773 | | f | = 4.18e-06 | f = 1.75e-09
it = 774 | | f | = 4.14e-06 | f = 1.72e-09
it = 775 | | f | = 4.10e-06 | f = 1.68e-09
it = 776 | | f | = 4.06e-06 | f = 1.65e-09
it = 777 | | f | = 4.02e-06 | f = 1.62e-09
it = 778 | | f | = 3.98e-06 | f = 1.58e-09
it = 779 | | f | = 3.94e-06 | f = 1.55e-09
it = 780 | | f | = 3.90e-06 | f = 1.52e-09
it = 781 | | f | = 3.86e-06 | f = 1.49e-09
it = 782 | | f | = 3.82e-06 | f = 1.46e-09
it = 783 | | f | = 3.78e-06 | f = 1.43e-09

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it = 784 | | f | = 3.75e-06 | f = 1.40e-09
it = 785 | | f | = 3.71e-06 | f = 1.38e-09
it = 786 | | f | = 3.67e-06 | f = 1.35e-09
it = 787 | | f | = 3.64e-06 | f = 1.32e-09
it = 788 | | f | = 3.60e-06 | f = 1.30e-09
it = 789 | | f | = 3.56e-06 | f = 1.27e-09
it = 790 | | f | = 3.53e-06 | f = 1.24e-09
it = 791 | | f | = 3.49e-06 | f = 1.22e-09
it = 792 | | f | = 3.46e-06 | f = 1.20e-09
it = 793 | | f | = 3.42e-06 | f = 1.17e-09
it = 794 | | f | = 3.39e-06 | f = 1.15e-09
it = 795 | | f | = 3.35e-06 | f = 1.13e-09
it = 796 | | f | = 3.32e-06 | f = 1.10e-09
it = 797 | | f | = 3.29e-06 | f = 1.08e-09
it = 798 | | f | = 3.25e-06 | f = 1.06e-09
it = 799 | | f | = 3.22e-06 | f = 1.04e-09
it = 800 | | f | = 3.19e-06 | f = 1.02e-09
it = 801 | | f | = 3.16e-06 | f = 9.97e-10
it = 802 | | f | = 3.13e-06 | f = 9.78e-10
it = 803 | | f | = 3.10e-06 | f = 9.58e-10
it = 804 | | f | = 3.06e-06 | f = 9.39e-10
it = 805 | | f | = 3.03e-06 | f = 9.20e-10
it = 806 | | f | = 3.00e-06 | f = 9.02e-10
it = 807 | | f | = 2.97e-06 | f = 8.84e-10
it = 808 | | f | = 2.94e-06 | f = 8.66e-10
it = 809 | | f | = 2.91e-06 | f = 8.49e-10
it = 810 | | f | = 2.88e-06 | f = 8.32e-10
it = 811 | | f | = 2.86e-06 | f = 8.16e-10
it = 812 | | f | = 2.83e-06 | f = 8.00e-10
it = 813 | | f | = 2.80e-06 | f = 7.84e-10
it = 814 | | f | = 2.77e-06 | f = 7.68e-10
it = 815 | | f | = 2.74e-06 | f = 7.53e-10
it = 816 | | f | = 2.72e-06 | f = 7.38e-10
it = 817 | | f | = 2.69e-06 | f = 7.23e-10
it = 818 | | f | = 2.66e-06 | f = 7.09e-10
it = 819 | | f | = 2.64e-06 | f = 6.95e-10
it = 820 | | f | = 2.61e-06 | f = 6.81e-10
it = 821 | | f | = 2.58e-06 | f = 6.67e-10
it = 822 | | f | = 2.56e-06 | f = 6.54e-10
it = 823 | | f | = 2.53e-06 | f = 6.41e-10
it = 824 | | f | = 2.51e-06 | f = 6.28e-10
it = 825 | | f | = 2.48e-06 | f = 6.16e-10
it = 826 | | f | = 2.46e-06 | f = 6.03e-10
it = 827 | | f | = 2.43e-06 | f = 5.91e-10
it = 828 | | f | = 2.41e-06 | f = 5.80e-10
it = 829 | | f | = 2.38e-06 | f = 5.68e-10
it = 830 | | f | = 2.36e-06 | f = 5.57e-10
it = 831 | | f | = 2.34e-06 | f = 5.46e-10

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it = 832 | | f | = 2.31e-06 | f = 5.35e-10
it = 833 | | f | = 2.29e-06 | f = 5.24e-10
it = 834 | | f | = 2.27e-06 | f = 5.14e-10
it = 835 | | f | = 2.24e-06 | f = 5.04e-10
it = 836 | | f | = 2.22e-06 | f = 4.94e-10
it = 837 | | f | = 2.20e-06 | f = 4.84e-10
it = 838 | | f | = 2.18e-06 | f = 4.74e-10
it = 839 | | f | = 2.16e-06 | f = 4.65e-10
it = 840 | | f | = 2.13e-06 | f = 4.55e-10
it = 841 | | f | = 2.11e-06 | f = 4.46e-10
it = 842 | | f | = 2.09e-06 | f = 4.37e-10
it = 843 | | f | = 2.07e-06 | f = 4.29e-10
it = 844 | | f | = 2.05e-06 | f = 4.20e-10
it = 845 | | f | = 2.03e-06 | f = 4.12e-10
it = 846 | | f | = 2.01e-06 | f = 4.04e-10
it = 847 | | f | = 1.99e-06 | f = 3.96e-10
it = 848 | | f | = 1.97e-06 | f = 3.88e-10
it = 849 | | f | = 1.95e-06 | f = 3.80e-10
it = 850 | | f | = 1.93e-06 | f = 3.72e-10
it = 851 | | f | = 1.91e-06 | f = 3.65e-10
it = 852 | | f | = 1.89e-06 | f = 3.58e-10
it = 853 | | f | = 1.87e-06 | f = 3.51e-10
it = 854 | | f | = 1.85e-06 | f = 3.44e-10
it = 855 | | f | = 1.84e-06 | f = 3.37e-10
it = 856 | | f | = 1.82e-06 | f = 3.30e-10
it = 857 | | f | = 1.80e-06 | f = 3.24e-10
it = 858 | | f | = 1.78e-06 | f = 3.17e-10
it = 859 | | f | = 1.76e-06 | f = 3.11e-10
it = 860 | | f | = 1.75e-06 | f = 3.05e-10
it = 861 | | f | = 1.73e-06 | f = 2.99e-10
it = 862 | | f | = 1.71e-06 | f = 2.93e-10
it = 863 | | f | = 1.69e-06 | f = 2.87e-10
it = 864 | | f | = 1.68e-06 | f = 2.81e-10
it = 865 | | f | = 1.66e-06 | f = 2.76e-10
it = 866 | | f | = 1.64e-06 | f = 2.70e-10
it = 867 | | f | = 1.63e-06 | f = 2.65e-10
it = 868 | | f | = 1.61e-06 | f = 2.59e-10
it = 869 | | f | = 1.59e-06 | f = 2.54e-10
it = 870 | | f | = 1.58e-06 | f = 2.49e-10
it = 871 | | f | = 1.56e-06 | f = 2.44e-10
it = 872 | | f | = 1.55e-06 | f = 2.39e-10
it = 873 | | f | = 1.53e-06 | f = 2.35e-10
it = 874 | | f | = 1.52e-06 | f = 2.30e-10
it = 875 | | f | = 1.50e-06 | f = 2.25e-10
it = 876 | | f | = 1.49e-06 | f = 2.21e-10
it = 877 | | f | = 1.47e-06 | f = 2.16e-10
it = 878 | | f | = 1.46e-06 | f = 2.12e-10
it = 879 | | f | = 1.44e-06 | f = 2.08e-10

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it = 880 | | f | = 1.43e-06 | f = 2.04e-10
it = 881 | | f | = 1.41e-06 | f = 2.00e-10
it = 882 | | f | = 1.40e-06 | f = 1.96e-10
it = 883 | | f | = 1.39e-06 | f = 1.92e-10
it = 884 | | f | = 1.37e-06 | f = 1.88e-10
it = 885 | | f | = 1.36e-06 | f = 1.84e-10
it = 886 | | f | = 1.34e-06 | f = 1.81e-10
it = 887 | | f | = 1.33e-06 | f = 1.77e-10
it = 888 | | f | = 1.32e-06 | f = 1.74e-10
it = 889 | | f | = 1.30e-06 | f = 1.70e-10
it = 890 | | f | = 1.29e-06 | f = 1.67e-10
it = 891 | | f | = 1.28e-06 | f = 1.63e-10
it = 892 | | f | = 1.27e-06 | f = 1.60e-10
it = 893 | | f | = 1.25e-06 | f = 1.57e-10
it = 894 | | f | = 1.24e-06 | f = 1.54e-10
it = 895 | | f | = 1.23e-06 | f = 1.51e-10
it = 896 | | f | = 1.22e-06 | f = 1.48e-10
it = 897 | | f | = 1.20e-06 | f = 1.45e-10
it = 898 | | f | = 1.19e-06 | f = 1.42e-10
it = 899 | | f | = 1.18e-06 | f = 1.39e-10
it = 900 | | f | = 1.17e-06 | f = 1.36e-10
it = 901 | | f | = 1.16e-06 | f = 1.34e-10
it = 902 | | f | = 1.14e-06 | f = 1.31e-10
it = 903 | | f | = 1.13e-06 | f = 1.28e-10
it = 904 | | f | = 1.12e-06 | f = 1.26e-10
it = 905 | | f | = 1.11e-06 | f = 1.23e-10
it = 906 | | f | = 1.10e-06 | f = 1.21e-10
it = 907 | | f | = 1.09e-06 | f = 1.18e-10
it = 908 | | f | = 1.08e-06 | f = 1.16e-10
it = 909 | | f | = 1.07e-06 | f = 1.14e-10
it = 910 | | f | = 1.06e-06 | f = 1.12e-10
it = 911 | | f | = 1.05e-06 | f = 1.09e-10
it = 912 | | f | = 1.03e-06 | f = 1.07e-10
it = 913 | | f | = 1.02e-06 | f = 1.05e-10
it = 914 | | f | = 1.01e-06 | f = 1.03e-10
it = 915 | | f | = 1.00e-06 | f = 1.01e-10
it = 916 | | f | = 9.94e-07 | f = 9.88e-11

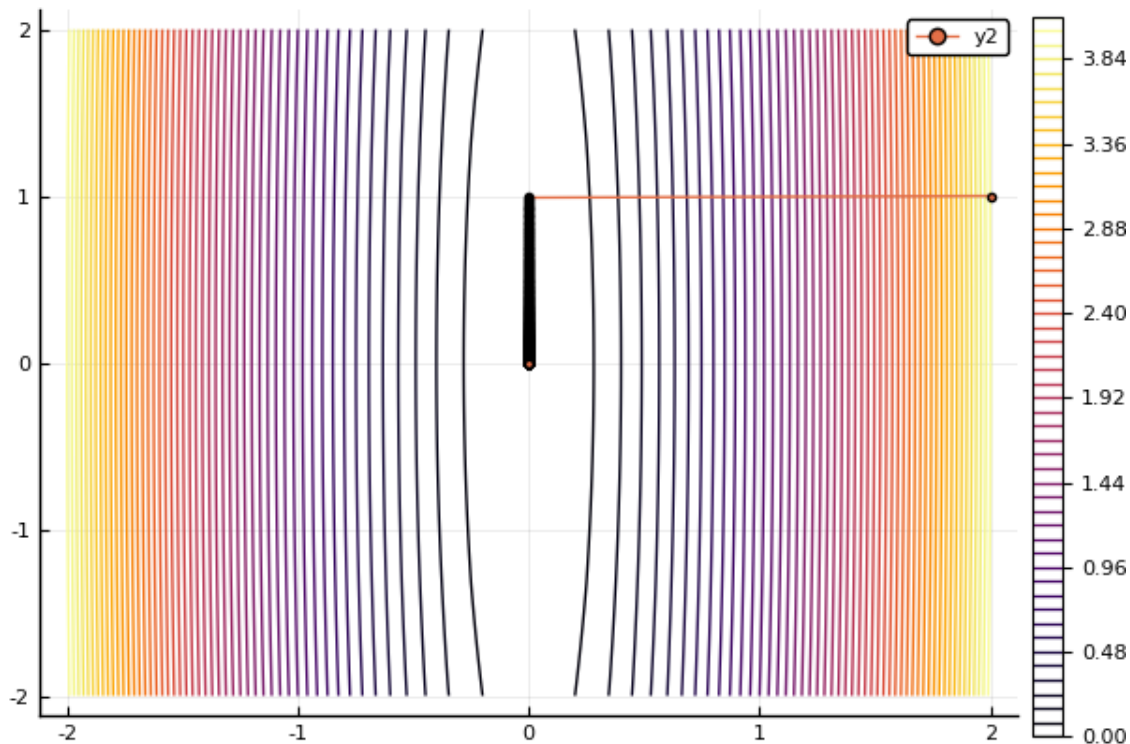
```

```

[144]: f(x1,x2) = x1^2 + x2^2/100
      x1 = -2:0.05:2
      x2 = -2:0.05:2
      contour(x1, x2, f, levels = 50)
      plot!(xtrace[:,1],xtrace[:,2],marker = 3)

```

[144]:



```
[138]: #Rosenbrock
A = [802 -400;-400 200]
     = eigvals(A)
```

```
[138]: 2-element Array{Float64,1}:
        0.3993607674876216
        1001.6006392325123
```

```
[139]: = [2]/ [1]
```

```
[139]: 2508.0096012775152
```

```
[166]: f(x) = 100(x[2]-x[1]^2)^2+(1-x[1])^2
        f(x) = ForwardDiff.gradient(f,x)
        x0 = [2,5]
        x, xtrace = grad_method_backtracking(f, f, x0, = 1e-4, maxits = 1000);
```

```
it = 0 | |f| = 7.92e+02 | f = 6.72e+01
it = 1 | |f| = 8.80e+01 | f = 2.44e+00
it = 2 | |f| = 5.41e-01 | f = 1.49e+00
it = 3 | |f| = 4.56e+00 | f = 1.49e+00
it = 4 | |f| = 4.66e+00 | f = 1.49e+00
it = 5 | |f| = 4.76e+00 | f = 1.49e+00
it = 6 | |f| = 4.86e+00 | f = 1.49e+00
```



```

it = 7 | | f| = 4.97e+00 | f = 1.49e+00
it = 8 | | f| = 5.07e+00 | f = 1.49e+00
it = 9 | | f| = 5.18e+00 | f = 1.49e+00
it = 10 | | f| = 5.39e-01 | f = 1.49e+00
it = 11 | | f| = 7.74e+00 | f = 1.49e+00
it = 12 | | f| = 5.39e-01 | f = 1.48e+00
it = 13 | | f| = 4.36e+00 | f = 1.48e+00
it = 14 | | f| = 4.42e+00 | f = 1.48e+00
it = 15 | | f| = 4.47e+00 | f = 1.48e+00
it = 16 | | f| = 4.52e+00 | f = 1.48e+00
it = 17 | | f| = 4.57e+00 | f = 1.48e+00
it = 18 | | f| = 4.62e+00 | f = 1.48e+00
it = 19 | | f| = 4.68e+00 | f = 1.48e+00
it = 20 | | f| = 4.73e+00 | f = 1.48e+00
it = 21 | | f| = 4.78e+00 | f = 1.48e+00
it = 22 | | f| = 4.84e+00 | f = 1.47e+00
it = 23 | | f| = 4.89e+00 | f = 1.47e+00
it = 24 | | f| = 4.94e+00 | f = 1.47e+00
it = 25 | | f| = 5.00e+00 | f = 1.47e+00
it = 26 | | f| = 5.05e+00 | f = 1.47e+00
it = 27 | | f| = 5.10e+00 | f = 1.47e+00
it = 28 | | f| = 5.16e+00 | f = 1.47e+00
it = 29 | | f| = 5.21e+00 | f = 1.47e+00
it = 30 | | f| = 5.27e+00 | f = 1.47e+00
it = 31 | | f| = 5.32e+00 | f = 1.47e+00
it = 32 | | f| = 5.37e+00 | f = 1.47e+00
it = 33 | | f| = 5.43e+00 | f = 1.47e+00
it = 34 | | f| = 5.48e+00 | f = 1.47e+00
it = 35 | | f| = 5.54e+00 | f = 1.47e+00
it = 36 | | f| = 5.59e+00 | f = 1.47e+00
it = 37 | | f| = 5.64e+00 | f = 1.47e+00
it = 38 | | f| = 5.70e+00 | f = 1.47e+00
it = 39 | | f| = 5.75e+00 | f = 1.47e+00
it = 40 | | f| = 5.81e+00 | f = 1.47e+00
it = 41 | | f| = 5.86e+00 | f = 1.47e+00
it = 42 | | f| = 5.91e+00 | f = 1.47e+00
it = 43 | | f| = 5.97e+00 | f = 1.47e+00
it = 44 | | f| = 6.02e+00 | f = 1.47e+00
it = 45 | | f| = 6.07e+00 | f = 1.47e+00
it = 46 | | f| = 6.13e+00 | f = 1.47e+00
it = 47 | | f| = 6.18e+00 | f = 1.47e+00
it = 48 | | f| = 6.23e+00 | f = 1.47e+00
it = 49 | | f| = 6.29e+00 | f = 1.47e+00
it = 50 | | f| = 6.34e+00 | f = 1.47e+00
it = 51 | | f| = 6.39e+00 | f = 1.47e+00
it = 52 | | f| = 6.45e+00 | f = 1.47e+00
it = 53 | | f| = 6.50e+00 | f = 1.47e+00
it = 54 | | f| = 6.55e+00 | f = 1.47e+00

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```
it = 55 | | f | = 6.60e+00 | f = 1.47e+00
it = 56 | | f | = 6.65e+00 | f = 1.47e+00
it = 57 | | f | = 6.70e+00 | f = 1.47e+00
it = 58 | | f | = 6.76e+00 | f = 1.47e+00
it = 59 | | f | = 6.81e+00 | f = 1.47e+00
it = 60 | | f | = 6.86e+00 | f = 1.47e+00
it = 61 | | f | = 6.91e+00 | f = 1.47e+00
it = 62 | | f | = 6.96e+00 | f = 1.47e+00
it = 63 | | f | = 7.01e+00 | f = 1.47e+00
it = 64 | | f | = 7.06e+00 | f = 1.47e+00
it = 65 | | f | = 7.11e+00 | f = 1.47e+00
it = 66 | | f | = 7.15e+00 | f = 1.47e+00
it = 67 | | f | = 7.20e+00 | f = 1.47e+00
it = 68 | | f | = 7.25e+00 | f = 1.47e+00
it = 69 | | f | = 7.30e+00 | f = 1.47e+00
it = 70 | | f | = 7.34e+00 | f = 1.47e+00
it = 71 | | f | = 7.39e+00 | f = 1.47e+00
it = 72 | | f | = 7.44e+00 | f = 1.47e+00
it = 73 | | f | = 7.48e+00 | f = 1.47e+00
it = 74 | | f | = 7.53e+00 | f = 1.47e+00
it = 75 | | f | = 7.57e+00 | f = 1.47e+00
it = 76 | | f | = 7.62e+00 | f = 1.47e+00
it = 77 | | f | = 7.66e+00 | f = 1.47e+00
it = 78 | | f | = 7.70e+00 | f = 1.47e+00
it = 79 | | f | = 7.75e+00 | f = 1.47e+00
it = 80 | | f | = 7.79e+00 | f = 1.47e+00
it = 81 | | f | = 7.83e+00 | f = 1.47e+00
it = 82 | | f | = 7.87e+00 | f = 1.47e+00
it = 83 | | f | = 7.91e+00 | f = 1.47e+00
it = 84 | | f | = 7.95e+00 | f = 1.47e+00
it = 85 | | f | = 7.99e+00 | f = 1.47e+00
it = 86 | | f | = 8.03e+00 | f = 1.47e+00
it = 87 | | f | = 8.07e+00 | f = 1.47e+00
it = 88 | | f | = 8.11e+00 | f = 1.47e+00
it = 89 | | f | = 8.14e+00 | f = 1.47e+00
it = 90 | | f | = 8.18e+00 | f = 1.47e+00
it = 91 | | f | = 8.22e+00 | f = 1.47e+00
it = 92 | | f | = 8.25e+00 | f = 1.47e+00
it = 93 | | f | = 8.28e+00 | f = 1.47e+00
it = 94 | | f | = 8.32e+00 | f = 1.47e+00
it = 95 | | f | = 8.35e+00 | f = 1.47e+00
it = 96 | | f | = 8.38e+00 | f = 1.47e+00
it = 97 | | f | = 8.42e+00 | f = 1.47e+00
it = 98 | | f | = 8.45e+00 | f = 1.47e+00
it = 99 | | f | = 8.48e+00 | f = 1.47e+00
it = 100 | | f | = 8.51e+00 | f = 1.47e+00
it = 101 | | f | = 8.53e+00 | f = 1.47e+00
it = 102 | | f | = 8.56e+00 | f = 1.47e+00
```

it = 103 | | f | = 8.59e+00 | f = 1.47e+00
it = 104 | | f | = 8.62e+00 | f = 1.47e+00
it = 105 | | f | = 8.64e+00 | f = 1.47e+00
it = 106 | | f | = 8.67e+00 | f = 1.47e+00
it = 107 | | f | = 8.69e+00 | f = 1.47e+00
it = 108 | | f | = 8.71e+00 | f = 1.47e+00
it = 109 | | f | = 8.74e+00 | f = 1.47e+00
it = 110 | | f | = 8.76e+00 | f = 1.47e+00
it = 111 | | f | = 8.78e+00 | f = 1.47e+00
it = 112 | | f | = 8.80e+00 | f = 1.47e+00
it = 113 | | f | = 8.82e+00 | f = 1.47e+00
it = 114 | | f | = 8.84e+00 | f = 1.47e+00
it = 115 | | f | = 8.85e+00 | f = 1.47e+00
it = 116 | | f | = 8.87e+00 | f = 1.47e+00
it = 117 | | f | = 8.89e+00 | f = 1.47e+00
it = 118 | | f | = 8.90e+00 | f = 1.47e+00
it = 119 | | f | = 8.92e+00 | f = 1.47e+00
it = 120 | | f | = 8.93e+00 | f = 1.47e+00
it = 121 | | f | = 8.94e+00 | f = 1.47e+00
it = 122 | | f | = 8.95e+00 | f = 1.47e+00
it = 123 | | f | = 8.96e+00 | f = 1.47e+00
it = 124 | | f | = 8.97e+00 | f = 1.47e+00
it = 125 | | f | = 8.98e+00 | f = 1.47e+00
it = 126 | | f | = 8.99e+00 | f = 1.47e+00
it = 127 | | f | = 9.00e+00 | f = 1.47e+00
it = 128 | | f | = 9.00e+00 | f = 1.47e+00
it = 129 | | f | = 9.01e+00 | f = 1.47e+00
it = 130 | | f | = 9.01e+00 | f = 1.47e+00
it = 131 | | f | = 9.02e+00 | f = 1.47e+00
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it = 134 | | f | = 9.02e+00 | f = 1.47e+00
it = 135 | | f | = 9.02e+00 | f = 1.47e+00
it = 136 | | f | = 9.02e+00 | f = 1.47e+00
it = 137 | | f | = 9.02e+00 | f = 1.47e+00
it = 138 | | f | = 9.02e+00 | f = 1.47e+00
it = 139 | | f | = 9.01e+00 | f = 1.47e+00
it = 140 | | f | = 9.01e+00 | f = 1.47e+00
it = 141 | | f | = 9.00e+00 | f = 1.47e+00
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it = 143 | | f | = 8.99e+00 | f = 1.47e+00
it = 144 | | f | = 8.98e+00 | f = 1.46e+00
it = 145 | | f | = 8.97e+00 | f = 1.46e+00
it = 146 | | f | = 8.96e+00 | f = 1.46e+00
it = 147 | | f | = 8.95e+00 | f = 1.46e+00
it = 148 | | f | = 8.94e+00 | f = 1.46e+00
it = 149 | | f | = 8.93e+00 | f = 1.46e+00
it = 150 | | f | = 8.92e+00 | f = 1.46e+00

it = 151 | | f | = 8.90e+00 | f = 1.46e+00
it = 152 | | f | = 8.89e+00 | f = 1.46e+00
it = 153 | | f | = 8.87e+00 | f = 1.46e+00
it = 154 | | f | = 8.85e+00 | f = 1.46e+00
it = 155 | | f | = 8.84e+00 | f = 1.46e+00
it = 156 | | f | = 8.82e+00 | f = 1.46e+00
it = 157 | | f | = 8.80e+00 | f = 1.46e+00
it = 158 | | f | = 8.78e+00 | f = 1.46e+00
it = 159 | | f | = 8.76e+00 | f = 1.46e+00
it = 160 | | f | = 8.74e+00 | f = 1.46e+00
it = 161 | | f | = 8.71e+00 | f = 1.46e+00
it = 162 | | f | = 8.69e+00 | f = 1.46e+00
it = 163 | | f | = 8.67e+00 | f = 1.46e+00
it = 164 | | f | = 8.64e+00 | f = 1.46e+00
it = 165 | | f | = 8.62e+00 | f = 1.46e+00
it = 166 | | f | = 8.59e+00 | f = 1.46e+00
it = 167 | | f | = 8.56e+00 | f = 1.46e+00
it = 168 | | f | = 8.53e+00 | f = 1.46e+00
it = 169 | | f | = 8.51e+00 | f = 1.46e+00
it = 170 | | f | = 8.48e+00 | f = 1.46e+00
it = 171 | | f | = 8.45e+00 | f = 1.46e+00
it = 172 | | f | = 8.41e+00 | f = 1.46e+00
it = 173 | | f | = 8.38e+00 | f = 1.46e+00
it = 174 | | f | = 8.35e+00 | f = 1.46e+00
it = 175 | | f | = 8.32e+00 | f = 1.46e+00
it = 176 | | f | = 8.28e+00 | f = 1.46e+00
it = 177 | | f | = 8.25e+00 | f = 1.46e+00
it = 178 | | f | = 8.21e+00 | f = 1.46e+00
it = 179 | | f | = 8.18e+00 | f = 1.46e+00
it = 180 | | f | = 8.14e+00 | f = 1.46e+00
it = 181 | | f | = 8.10e+00 | f = 1.46e+00
it = 182 | | f | = 8.07e+00 | f = 1.46e+00
it = 183 | | f | = 8.03e+00 | f = 1.46e+00
it = 184 | | f | = 7.99e+00 | f = 1.46e+00
it = 185 | | f | = 7.95e+00 | f = 1.46e+00
it = 186 | | f | = 7.91e+00 | f = 1.46e+00
it = 187 | | f | = 7.87e+00 | f = 1.46e+00
it = 188 | | f | = 7.83e+00 | f = 1.46e+00
it = 189 | | f | = 7.79e+00 | f = 1.46e+00
it = 190 | | f | = 7.74e+00 | f = 1.46e+00
it = 191 | | f | = 7.70e+00 | f = 1.46e+00
it = 192 | | f | = 7.66e+00 | f = 1.46e+00
it = 193 | | f | = 7.61e+00 | f = 1.46e+00
it = 194 | | f | = 7.57e+00 | f = 1.46e+00
it = 195 | | f | = 7.52e+00 | f = 1.45e+00
it = 196 | | f | = 7.48e+00 | f = 1.45e+00
it = 197 | | f | = 7.43e+00 | f = 1.45e+00
it = 198 | | f | = 7.39e+00 | f = 1.45e+00

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it = 199 | | f | = 7.34e+00 | f = 1.45e+00
it = 200 | | f | = 7.29e+00 | f = 1.45e+00
it = 201 | | f | = 7.25e+00 | f = 1.45e+00
it = 202 | | f | = 7.20e+00 | f = 1.45e+00
it = 203 | | f | = 7.15e+00 | f = 1.45e+00
it = 204 | | f | = 7.10e+00 | f = 1.45e+00
it = 205 | | f | = 7.05e+00 | f = 1.45e+00
it = 206 | | f | = 7.00e+00 | f = 1.45e+00
it = 207 | | f | = 6.95e+00 | f = 1.45e+00
it = 208 | | f | = 6.90e+00 | f = 1.45e+00
it = 209 | | f | = 6.85e+00 | f = 1.45e+00
it = 210 | | f | = 6.80e+00 | f = 1.45e+00
it = 211 | | f | = 6.75e+00 | f = 1.45e+00
it = 212 | | f | = 6.70e+00 | f = 1.45e+00
it = 213 | | f | = 6.65e+00 | f = 1.45e+00
it = 214 | | f | = 6.60e+00 | f = 1.45e+00
it = 215 | | f | = 6.54e+00 | f = 1.45e+00
it = 216 | | f | = 6.49e+00 | f = 1.45e+00
it = 217 | | f | = 6.44e+00 | f = 1.45e+00
it = 218 | | f | = 6.39e+00 | f = 1.45e+00
it = 219 | | f | = 6.33e+00 | f = 1.45e+00
it = 220 | | f | = 6.28e+00 | f = 1.45e+00
it = 221 | | f | = 6.23e+00 | f = 1.45e+00
it = 222 | | f | = 6.17e+00 | f = 1.45e+00
it = 223 | | f | = 6.12e+00 | f = 1.45e+00
it = 224 | | f | = 6.07e+00 | f = 1.45e+00
it = 225 | | f | = 6.01e+00 | f = 1.45e+00
it = 226 | | f | = 5.96e+00 | f = 1.45e+00
it = 227 | | f | = 5.90e+00 | f = 1.45e+00
it = 228 | | f | = 5.85e+00 | f = 1.45e+00
it = 229 | | f | = 5.80e+00 | f = 1.45e+00
it = 230 | | f | = 5.74e+00 | f = 1.45e+00
it = 231 | | f | = 5.69e+00 | f = 1.45e+00
it = 232 | | f | = 5.63e+00 | f = 1.45e+00
it = 233 | | f | = 5.58e+00 | f = 1.45e+00
it = 234 | | f | = 5.52e+00 | f = 1.45e+00
it = 235 | | f | = 5.47e+00 | f = 1.45e+00
it = 236 | | f | = 5.42e+00 | f = 1.45e+00
it = 237 | | f | = 5.36e+00 | f = 1.45e+00
it = 238 | | f | = 5.31e+00 | f = 1.45e+00
it = 239 | | f | = 5.25e+00 | f = 1.45e+00
it = 240 | | f | = 5.20e+00 | f = 1.45e+00
it = 241 | | f | = 5.14e+00 | f = 1.44e+00
it = 242 | | f | = 5.09e+00 | f = 1.44e+00
it = 243 | | f | = 5.04e+00 | f = 1.44e+00
it = 244 | | f | = 4.98e+00 | f = 1.44e+00
it = 245 | | f | = 4.93e+00 | f = 1.44e+00
it = 246 | | f | = 4.88e+00 | f = 1.44e+00

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it = 247 | | f | = 4.82e+00 | f = 1.44e+00
it = 248 | | f | = 4.77e+00 | f = 1.44e+00
it = 249 | | f | = 4.72e+00 | f = 1.44e+00
it = 250 | | f | = 4.66e+00 | f = 1.44e+00
it = 251 | | f | = 4.61e+00 | f = 1.44e+00
it = 252 | | f | = 4.56e+00 | f = 1.44e+00
it = 253 | | f | = 4.50e+00 | f = 1.44e+00
it = 254 | | f | = 4.45e+00 | f = 1.44e+00
it = 255 | | f | = 4.40e+00 | f = 1.44e+00
it = 256 | | f | = 4.35e+00 | f = 1.44e+00
it = 257 | | f | = 4.30e+00 | f = 1.44e+00
it = 258 | | f | = 4.24e+00 | f = 1.44e+00
it = 259 | | f | = 4.19e+00 | f = 1.44e+00
it = 260 | | f | = 4.14e+00 | f = 1.44e+00
it = 261 | | f | = 4.09e+00 | f = 1.44e+00
it = 262 | | f | = 4.04e+00 | f = 1.44e+00
it = 263 | | f | = 3.99e+00 | f = 1.44e+00
it = 264 | | f | = 3.94e+00 | f = 1.44e+00
it = 265 | | f | = 3.89e+00 | f = 1.44e+00
it = 266 | | f | = 3.84e+00 | f = 1.44e+00
it = 267 | | f | = 3.79e+00 | f = 1.44e+00
it = 268 | | f | = 3.74e+00 | f = 1.44e+00
it = 269 | | f | = 3.69e+00 | f = 1.44e+00
it = 270 | | f | = 3.64e+00 | f = 1.44e+00
it = 271 | | f | = 3.60e+00 | f = 1.44e+00
it = 272 | | f | = 3.55e+00 | f = 1.44e+00
it = 273 | | f | = 3.50e+00 | f = 1.44e+00
it = 274 | | f | = 3.45e+00 | f = 1.44e+00
it = 275 | | f | = 3.41e+00 | f = 1.44e+00
it = 276 | | f | = 3.36e+00 | f = 1.44e+00
it = 277 | | f | = 3.31e+00 | f = 1.44e+00
it = 278 | | f | = 3.27e+00 | f = 1.44e+00
it = 279 | | f | = 3.22e+00 | f = 1.44e+00
it = 280 | | f | = 3.18e+00 | f = 1.44e+00
it = 281 | | f | = 3.13e+00 | f = 1.44e+00
it = 282 | | f | = 3.09e+00 | f = 1.44e+00
it = 283 | | f | = 3.04e+00 | f = 1.44e+00
it = 284 | | f | = 3.00e+00 | f = 1.44e+00
it = 285 | | f | = 2.96e+00 | f = 1.44e+00
it = 286 | | f | = 2.92e+00 | f = 1.44e+00
it = 287 | | f | = 2.87e+00 | f = 1.44e+00
it = 288 | | f | = 2.83e+00 | f = 1.44e+00
it = 289 | | f | = 2.79e+00 | f = 1.44e+00
it = 290 | | f | = 2.75e+00 | f = 1.44e+00
it = 291 | | f | = 2.71e+00 | f = 1.44e+00
it = 292 | | f | = 2.67e+00 | f = 1.44e+00
it = 293 | | f | = 2.63e+00 | f = 1.44e+00
it = 294 | | f | = 2.59e+00 | f = 1.44e+00

it = 295 | | f | = 2.55e+00 | f = 1.43e+00
it = 296 | | f | = 2.51e+00 | f = 1.43e+00
it = 297 | | f | = 2.47e+00 | f = 1.43e+00
it = 298 | | f | = 2.43e+00 | f = 1.43e+00
it = 299 | | f | = 2.39e+00 | f = 1.43e+00
it = 300 | | f | = 2.36e+00 | f = 1.43e+00
it = 301 | | f | = 2.32e+00 | f = 1.43e+00
it = 302 | | f | = 2.28e+00 | f = 1.43e+00
it = 303 | | f | = 2.25e+00 | f = 1.43e+00
it = 304 | | f | = 2.21e+00 | f = 1.43e+00
it = 305 | | f | = 2.18e+00 | f = 1.43e+00
it = 306 | | f | = 2.14e+00 | f = 1.43e+00
it = 307 | | f | = 2.11e+00 | f = 1.43e+00
it = 308 | | f | = 2.07e+00 | f = 1.43e+00
it = 309 | | f | = 2.04e+00 | f = 1.43e+00
it = 310 | | f | = 2.01e+00 | f = 1.43e+00
it = 311 | | f | = 1.98e+00 | f = 1.43e+00
it = 312 | | f | = 1.94e+00 | f = 1.43e+00
it = 313 | | f | = 1.91e+00 | f = 1.43e+00
it = 314 | | f | = 1.88e+00 | f = 1.43e+00
it = 315 | | f | = 1.85e+00 | f = 1.43e+00
it = 316 | | f | = 1.82e+00 | f = 1.43e+00
it = 317 | | f | = 1.79e+00 | f = 1.43e+00
it = 318 | | f | = 1.76e+00 | f = 1.43e+00
it = 319 | | f | = 1.73e+00 | f = 1.43e+00
it = 320 | | f | = 1.70e+00 | f = 1.43e+00
it = 321 | | f | = 1.67e+00 | f = 1.43e+00
it = 322 | | f | = 1.65e+00 | f = 1.43e+00
it = 323 | | f | = 1.62e+00 | f = 1.43e+00
it = 324 | | f | = 1.59e+00 | f = 1.43e+00
it = 325 | | f | = 1.56e+00 | f = 1.43e+00
it = 326 | | f | = 1.54e+00 | f = 1.43e+00
it = 327 | | f | = 1.51e+00 | f = 1.43e+00
it = 328 | | f | = 1.49e+00 | f = 1.43e+00
it = 329 | | f | = 1.46e+00 | f = 1.43e+00
it = 330 | | f | = 1.44e+00 | f = 1.43e+00
it = 331 | | f | = 1.41e+00 | f = 1.43e+00
it = 332 | | f | = 1.39e+00 | f = 1.43e+00
it = 333 | | f | = 1.37e+00 | f = 1.43e+00
it = 334 | | f | = 1.34e+00 | f = 1.43e+00
it = 335 | | f | = 1.32e+00 | f = 1.43e+00
it = 336 | | f | = 1.30e+00 | f = 1.43e+00
it = 337 | | f | = 1.28e+00 | f = 1.43e+00
it = 338 | | f | = 1.26e+00 | f = 1.43e+00
it = 339 | | f | = 1.24e+00 | f = 1.43e+00
it = 340 | | f | = 1.22e+00 | f = 1.43e+00
it = 341 | | f | = 1.20e+00 | f = 1.43e+00
it = 342 | | f | = 1.18e+00 | f = 1.43e+00

it = 343 | | f | = 1.16e+00 | f = 1.43e+00
it = 344 | | f | = 1.14e+00 | f = 1.43e+00
it = 345 | | f | = 1.12e+00 | f = 1.43e+00
it = 346 | | f | = 1.10e+00 | f = 1.43e+00
it = 347 | | f | = 1.08e+00 | f = 1.43e+00
it = 348 | | f | = 1.07e+00 | f = 1.43e+00
it = 349 | | f | = 1.05e+00 | f = 1.43e+00
it = 350 | | f | = 1.03e+00 | f = 1.43e+00
it = 351 | | f | = 1.02e+00 | f = 1.43e+00
it = 352 | | f | = 1.00e+00 | f = 1.43e+00
it = 353 | | f | = 9.85e-01 | f = 1.43e+00
it = 354 | | f | = 9.70e-01 | f = 1.43e+00
it = 355 | | f | = 9.55e-01 | f = 1.43e+00
it = 356 | | f | = 9.41e-01 | f = 1.43e+00
it = 357 | | f | = 9.27e-01 | f = 1.43e+00
it = 358 | | f | = 9.13e-01 | f = 1.43e+00
it = 359 | | f | = 9.00e-01 | f = 1.43e+00
it = 360 | | f | = 8.87e-01 | f = 1.43e+00
it = 361 | | f | = 8.74e-01 | f = 1.43e+00
it = 362 | | f | = 8.62e-01 | f = 1.43e+00
it = 363 | | f | = 8.50e-01 | f = 1.42e+00
it = 364 | | f | = 8.38e-01 | f = 1.42e+00
it = 365 | | f | = 8.26e-01 | f = 1.42e+00
it = 366 | | f | = 8.15e-01 | f = 1.42e+00
it = 367 | | f | = 8.05e-01 | f = 1.42e+00
it = 368 | | f | = 7.94e-01 | f = 1.42e+00
it = 369 | | f | = 7.84e-01 | f = 1.42e+00
it = 370 | | f | = 7.74e-01 | f = 1.42e+00
it = 371 | | f | = 7.65e-01 | f = 1.42e+00
it = 372 | | f | = 7.55e-01 | f = 1.42e+00
it = 373 | | f | = 7.46e-01 | f = 1.42e+00
it = 374 | | f | = 1.64e+00 | f = 1.42e+00
it = 375 | | f | = 1.60e+00 | f = 1.42e+00
it = 376 | | f | = 1.57e+00 | f = 1.42e+00
it = 377 | | f | = 1.54e+00 | f = 1.42e+00
it = 378 | | f | = 1.50e+00 | f = 1.42e+00
it = 379 | | f | = 1.47e+00 | f = 1.42e+00
it = 380 | | f | = 1.44e+00 | f = 1.42e+00
it = 381 | | f | = 1.41e+00 | f = 1.42e+00
it = 382 | | f | = 1.38e+00 | f = 1.42e+00
it = 383 | | f | = 1.35e+00 | f = 1.42e+00
it = 384 | | f | = 1.32e+00 | f = 1.42e+00
it = 385 | | f | = 1.30e+00 | f = 1.42e+00
it = 386 | | f | = 1.27e+00 | f = 1.42e+00
it = 387 | | f | = 1.24e+00 | f = 1.42e+00
it = 388 | | f | = 1.22e+00 | f = 1.42e+00
it = 389 | | f | = 1.19e+00 | f = 1.42e+00
it = 390 | | f | = 1.17e+00 | f = 1.42e+00


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it = 391 | | f | = 1.14e+00 | f = 1.42e+00
it = 392 | | f | = 1.12e+00 | f = 1.42e+00
it = 393 | | f | = 1.10e+00 | f = 1.42e+00
it = 394 | | f | = 1.08e+00 | f = 1.42e+00
it = 395 | | f | = 1.06e+00 | f = 1.42e+00
it = 396 | | f | = 1.04e+00 | f = 1.42e+00
it = 397 | | f | = 1.02e+00 | f = 1.42e+00
it = 398 | | f | = 9.97e-01 | f = 1.42e+00
it = 399 | | f | = 9.78e-01 | f = 1.42e+00
it = 400 | | f | = 9.60e-01 | f = 1.42e+00
it = 401 | | f | = 9.43e-01 | f = 1.42e+00
it = 402 | | f | = 9.26e-01 | f = 1.42e+00
it = 403 | | f | = 9.09e-01 | f = 1.42e+00
it = 404 | | f | = 8.93e-01 | f = 1.42e+00
it = 405 | | f | = 8.78e-01 | f = 1.42e+00
it = 406 | | f | = 8.63e-01 | f = 1.42e+00
it = 407 | | f | = 8.48e-01 | f = 1.42e+00
it = 408 | | f | = 8.34e-01 | f = 1.42e+00
it = 409 | | f | = 8.21e-01 | f = 1.42e+00
it = 410 | | f | = 8.08e-01 | f = 1.42e+00
it = 411 | | f | = 7.95e-01 | f = 1.42e+00
it = 412 | | f | = 7.83e-01 | f = 1.42e+00
it = 413 | | f | = 7.72e-01 | f = 1.42e+00
it = 414 | | f | = 7.60e-01 | f = 1.42e+00
it = 415 | | f | = 7.50e-01 | f = 1.42e+00
it = 416 | | f | = 1.65e+00 | f = 1.42e+00
it = 417 | | f | = 1.61e+00 | f = 1.42e+00
it = 418 | | f | = 1.57e+00 | f = 1.42e+00
it = 419 | | f | = 1.53e+00 | f = 1.42e+00
it = 420 | | f | = 1.49e+00 | f = 1.42e+00
it = 421 | | f | = 1.45e+00 | f = 1.42e+00
it = 422 | | f | = 1.42e+00 | f = 1.42e+00
it = 423 | | f | = 1.38e+00 | f = 1.42e+00
it = 424 | | f | = 1.35e+00 | f = 1.42e+00
it = 425 | | f | = 1.31e+00 | f = 1.42e+00
it = 426 | | f | = 1.28e+00 | f = 1.42e+00
it = 427 | | f | = 1.25e+00 | f = 1.42e+00
it = 428 | | f | = 1.22e+00 | f = 1.42e+00
it = 429 | | f | = 1.19e+00 | f = 1.42e+00
it = 430 | | f | = 1.17e+00 | f = 1.42e+00
it = 431 | | f | = 1.14e+00 | f = 1.42e+00
it = 432 | | f | = 1.11e+00 | f = 1.42e+00
it = 433 | | f | = 1.09e+00 | f = 1.42e+00
it = 434 | | f | = 1.06e+00 | f = 1.41e+00
it = 435 | | f | = 1.04e+00 | f = 1.41e+00
it = 436 | | f | = 1.02e+00 | f = 1.41e+00
it = 437 | | f | = 9.93e-01 | f = 1.41e+00
it = 438 | | f | = 9.72e-01 | f = 1.41e+00

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it = 439 | | f | = 9.51e-01 | f = 1.41e+00
it = 440 | | f | = 9.31e-01 | f = 1.41e+00
it = 441 | | f | = 9.12e-01 | f = 1.41e+00
it = 442 | | f | = 8.94e-01 | f = 1.41e+00
it = 443 | | f | = 8.76e-01 | f = 1.41e+00
it = 444 | | f | = 8.59e-01 | f = 1.41e+00
it = 445 | | f | = 8.43e-01 | f = 1.41e+00
it = 446 | | f | = 8.27e-01 | f = 1.41e+00
it = 447 | | f | = 8.12e-01 | f = 1.41e+00
it = 448 | | f | = 7.97e-01 | f = 1.41e+00
it = 449 | | f | = 7.84e-01 | f = 1.41e+00
it = 450 | | f | = 7.70e-01 | f = 1.41e+00
it = 451 | | f | = 7.58e-01 | f = 1.41e+00
it = 452 | | f | = 7.46e-01 | f = 1.41e+00
it = 453 | | f | = 1.63e+00 | f = 1.41e+00
it = 454 | | f | = 1.58e+00 | f = 1.41e+00
it = 455 | | f | = 1.54e+00 | f = 1.41e+00
it = 456 | | f | = 1.50e+00 | f = 1.41e+00
it = 457 | | f | = 1.45e+00 | f = 1.41e+00
it = 458 | | f | = 1.41e+00 | f = 1.41e+00
it = 459 | | f | = 1.37e+00 | f = 1.41e+00
it = 460 | | f | = 1.34e+00 | f = 1.41e+00
it = 461 | | f | = 1.30e+00 | f = 1.41e+00
it = 462 | | f | = 1.26e+00 | f = 1.41e+00
it = 463 | | f | = 1.23e+00 | f = 1.41e+00
it = 464 | | f | = 1.20e+00 | f = 1.41e+00
it = 465 | | f | = 1.17e+00 | f = 1.41e+00
it = 466 | | f | = 1.14e+00 | f = 1.41e+00
it = 467 | | f | = 1.11e+00 | f = 1.41e+00
it = 468 | | f | = 1.08e+00 | f = 1.41e+00
it = 469 | | f | = 1.05e+00 | f = 1.41e+00
it = 470 | | f | = 1.02e+00 | f = 1.41e+00
it = 471 | | f | = 1.00e+00 | f = 1.41e+00
it = 472 | | f | = 9.76e-01 | f = 1.41e+00
it = 473 | | f | = 9.52e-01 | f = 1.41e+00
it = 474 | | f | = 9.30e-01 | f = 1.41e+00
it = 475 | | f | = 9.09e-01 | f = 1.41e+00
it = 476 | | f | = 8.89e-01 | f = 1.41e+00
it = 477 | | f | = 8.69e-01 | f = 1.41e+00
it = 478 | | f | = 8.51e-01 | f = 1.41e+00
it = 479 | | f | = 8.33e-01 | f = 1.41e+00
it = 480 | | f | = 8.16e-01 | f = 1.41e+00
it = 481 | | f | = 8.00e-01 | f = 1.41e+00
it = 482 | | f | = 7.84e-01 | f = 1.41e+00
it = 483 | | f | = 7.70e-01 | f = 1.41e+00
it = 484 | | f | = 7.56e-01 | f = 1.41e+00
it = 485 | | f | = 7.42e-01 | f = 1.41e+00
it = 486 | | f | = 1.61e+00 | f = 1.41e+00

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it = 487 | | f | = 1.56e+00 | f = 1.41e+00
it = 488 | | f | = 1.52e+00 | f = 1.41e+00
it = 489 | | f | = 1.47e+00 | f = 1.41e+00
it = 490 | | f | = 1.42e+00 | f = 1.41e+00
it = 491 | | f | = 1.38e+00 | f = 1.41e+00
it = 492 | | f | = 1.34e+00 | f = 1.41e+00
it = 493 | | f | = 1.30e+00 | f = 1.41e+00
it = 494 | | f | = 1.26e+00 | f = 1.41e+00
it = 495 | | f | = 1.22e+00 | f = 1.41e+00
it = 496 | | f | = 1.19e+00 | f = 1.41e+00
it = 497 | | f | = 1.15e+00 | f = 1.41e+00
it = 498 | | f | = 1.12e+00 | f = 1.41e+00
it = 499 | | f | = 1.09e+00 | f = 1.41e+00
it = 500 | | f | = 1.06e+00 | f = 1.41e+00
it = 501 | | f | = 1.03e+00 | f = 1.41e+00
it = 502 | | f | = 1.00e+00 | f = 1.41e+00
it = 503 | | f | = 9.74e-01 | f = 1.41e+00
it = 504 | | f | = 9.49e-01 | f = 1.41e+00
it = 505 | | f | = 9.25e-01 | f = 1.40e+00
it = 506 | | f | = 9.02e-01 | f = 1.40e+00
it = 507 | | f | = 8.80e-01 | f = 1.40e+00
it = 508 | | f | = 8.59e-01 | f = 1.40e+00
it = 509 | | f | = 8.40e-01 | f = 1.40e+00
it = 510 | | f | = 8.21e-01 | f = 1.40e+00
it = 511 | | f | = 8.03e-01 | f = 1.40e+00
it = 512 | | f | = 7.86e-01 | f = 1.40e+00
it = 513 | | f | = 7.70e-01 | f = 1.40e+00
it = 514 | | f | = 7.55e-01 | f = 1.40e+00
it = 515 | | f | = 1.66e+00 | f = 1.40e+00
it = 516 | | f | = 1.60e+00 | f = 1.40e+00
it = 517 | | f | = 1.55e+00 | f = 1.40e+00
it = 518 | | f | = 1.50e+00 | f = 1.40e+00
it = 519 | | f | = 1.45e+00 | f = 1.40e+00
it = 520 | | f | = 1.40e+00 | f = 1.40e+00
it = 521 | | f | = 1.35e+00 | f = 1.40e+00
it = 522 | | f | = 1.31e+00 | f = 1.40e+00
it = 523 | | f | = 1.27e+00 | f = 1.40e+00
it = 524 | | f | = 1.23e+00 | f = 1.40e+00
it = 525 | | f | = 1.19e+00 | f = 1.40e+00
it = 526 | | f | = 1.15e+00 | f = 1.40e+00
it = 527 | | f | = 1.11e+00 | f = 1.40e+00
it = 528 | | f | = 1.08e+00 | f = 1.40e+00
it = 529 | | f | = 1.05e+00 | f = 1.40e+00
it = 530 | | f | = 1.02e+00 | f = 1.40e+00
it = 531 | | f | = 9.88e-01 | f = 1.40e+00
it = 532 | | f | = 9.60e-01 | f = 1.40e+00
it = 533 | | f | = 9.34e-01 | f = 1.40e+00
it = 534 | | f | = 9.09e-01 | f = 1.40e+00

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it = 535 | | f | = 8.85e-01 | f = 1.40e+00
it = 536 | | f | = 8.62e-01 | f = 1.40e+00
it = 537 | | f | = 8.41e-01 | f = 1.40e+00
it = 538 | | f | = 8.20e-01 | f = 1.40e+00
it = 539 | | f | = 8.01e-01 | f = 1.40e+00
it = 540 | | f | = 7.83e-01 | f = 1.40e+00
it = 541 | | f | = 7.66e-01 | f = 1.40e+00
it = 542 | | f | = 7.50e-01 | f = 1.40e+00
it = 543 | | f | = 1.64e+00 | f = 1.40e+00
it = 544 | | f | = 1.58e+00 | f = 1.40e+00
it = 545 | | f | = 1.52e+00 | f = 1.40e+00
it = 546 | | f | = 1.47e+00 | f = 1.40e+00
it = 547 | | f | = 1.41e+00 | f = 1.40e+00
it = 548 | | f | = 1.36e+00 | f = 1.40e+00
it = 549 | | f | = 1.32e+00 | f = 1.40e+00
it = 550 | | f | = 1.27e+00 | f = 1.40e+00
it = 551 | | f | = 1.23e+00 | f = 1.40e+00
it = 552 | | f | = 1.19e+00 | f = 1.40e+00
it = 553 | | f | = 1.15e+00 | f = 1.40e+00
it = 554 | | f | = 1.11e+00 | f = 1.40e+00
it = 555 | | f | = 1.07e+00 | f = 1.40e+00
it = 556 | | f | = 1.04e+00 | f = 1.40e+00
it = 557 | | f | = 1.01e+00 | f = 1.40e+00
it = 558 | | f | = 9.75e-01 | f = 1.40e+00
it = 559 | | f | = 9.46e-01 | f = 1.40e+00
it = 560 | | f | = 9.19e-01 | f = 1.40e+00
it = 561 | | f | = 8.93e-01 | f = 1.40e+00
it = 562 | | f | = 8.68e-01 | f = 1.40e+00
it = 563 | | f | = 8.45e-01 | f = 1.40e+00
it = 564 | | f | = 8.23e-01 | f = 1.40e+00
it = 565 | | f | = 8.02e-01 | f = 1.40e+00
it = 566 | | f | = 7.83e-01 | f = 1.40e+00
it = 567 | | f | = 7.65e-01 | f = 1.40e+00
it = 568 | | f | = 7.47e-01 | f = 1.40e+00
it = 569 | | f | = 1.63e+00 | f = 1.40e+00
it = 570 | | f | = 1.57e+00 | f = 1.40e+00
it = 571 | | f | = 1.51e+00 | f = 1.40e+00
it = 572 | | f | = 1.45e+00 | f = 1.40e+00
it = 573 | | f | = 1.39e+00 | f = 1.40e+00
it = 574 | | f | = 1.34e+00 | f = 1.40e+00
it = 575 | | f | = 1.29e+00 | f = 1.40e+00
it = 576 | | f | = 1.24e+00 | f = 1.39e+00
it = 577 | | f | = 1.20e+00 | f = 1.39e+00
it = 578 | | f | = 1.16e+00 | f = 1.39e+00
it = 579 | | f | = 1.12e+00 | f = 1.39e+00
it = 580 | | f | = 1.08e+00 | f = 1.39e+00
it = 581 | | f | = 1.04e+00 | f = 1.39e+00
it = 582 | | f | = 1.01e+00 | f = 1.39e+00

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it = 583 | | f | = 9.73e-01 | f = 1.39e+00
it = 584 | | f | = 9.43e-01 | f = 1.39e+00
it = 585 | | f | = 9.14e-01 | f = 1.39e+00
it = 586 | | f | = 8.86e-01 | f = 1.39e+00
it = 587 | | f | = 8.61e-01 | f = 1.39e+00
it = 588 | | f | = 8.37e-01 | f = 1.39e+00
it = 589 | | f | = 8.14e-01 | f = 1.39e+00
it = 590 | | f | = 7.93e-01 | f = 1.39e+00
it = 591 | | f | = 7.73e-01 | f = 1.39e+00
it = 592 | | f | = 7.54e-01 | f = 1.39e+00
it = 593 | | f | = 1.65e+00 | f = 1.39e+00
it = 594 | | f | = 1.58e+00 | f = 1.39e+00
it = 595 | | f | = 1.52e+00 | f = 1.39e+00
it = 596 | | f | = 1.46e+00 | f = 1.39e+00
it = 597 | | f | = 1.40e+00 | f = 1.39e+00
it = 598 | | f | = 1.34e+00 | f = 1.39e+00
it = 599 | | f | = 1.29e+00 | f = 1.39e+00
it = 600 | | f | = 1.24e+00 | f = 1.39e+00
it = 601 | | f | = 1.19e+00 | f = 1.39e+00
it = 602 | | f | = 1.15e+00 | f = 1.39e+00
it = 603 | | f | = 1.11e+00 | f = 1.39e+00
it = 604 | | f | = 1.07e+00 | f = 1.39e+00
it = 605 | | f | = 1.03e+00 | f = 1.39e+00
it = 606 | | f | = 9.93e-01 | f = 1.39e+00
it = 607 | | f | = 9.60e-01 | f = 1.39e+00
it = 608 | | f | = 9.28e-01 | f = 1.39e+00
it = 609 | | f | = 8.98e-01 | f = 1.39e+00
it = 610 | | f | = 8.71e-01 | f = 1.39e+00
it = 611 | | f | = 8.45e-01 | f = 1.39e+00
it = 612 | | f | = 8.20e-01 | f = 1.39e+00
it = 613 | | f | = 7.97e-01 | f = 1.39e+00
it = 614 | | f | = 7.76e-01 | f = 1.39e+00
it = 615 | | f | = 7.56e-01 | f = 1.39e+00
it = 616 | | f | = 7.38e-01 | f = 1.39e+00
it = 617 | | f | = 1.59e+00 | f = 1.39e+00
it = 618 | | f | = 1.52e+00 | f = 1.39e+00
it = 619 | | f | = 1.45e+00 | f = 1.39e+00
it = 620 | | f | = 1.39e+00 | f = 1.39e+00
it = 621 | | f | = 1.34e+00 | f = 1.39e+00
it = 622 | | f | = 1.28e+00 | f = 1.39e+00
it = 623 | | f | = 1.23e+00 | f = 1.39e+00
it = 624 | | f | = 1.18e+00 | f = 1.39e+00
it = 625 | | f | = 1.13e+00 | f = 1.39e+00
it = 626 | | f | = 1.09e+00 | f = 1.39e+00
it = 627 | | f | = 1.05e+00 | f = 1.39e+00
it = 628 | | f | = 1.01e+00 | f = 1.39e+00
it = 629 | | f | = 9.74e-01 | f = 1.39e+00
it = 630 | | f | = 9.40e-01 | f = 1.39e+00

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it = 631 | | f | = 9.08e-01 | f = 1.39e+00
it = 632 | | f | = 8.78e-01 | f = 1.39e+00
it = 633 | | f | = 8.50e-01 | f = 1.39e+00
it = 634 | | f | = 8.25e-01 | f = 1.39e+00
it = 635 | | f | = 8.00e-01 | f = 1.39e+00
it = 636 | | f | = 7.78e-01 | f = 1.39e+00
it = 637 | | f | = 7.57e-01 | f = 1.39e+00
it = 638 | | f | = 7.37e-01 | f = 1.39e+00
it = 639 | | f | = 1.59e+00 | f = 1.39e+00
it = 640 | | f | = 1.51e+00 | f = 1.39e+00
it = 641 | | f | = 1.45e+00 | f = 1.39e+00
it = 642 | | f | = 1.38e+00 | f = 1.39e+00
it = 643 | | f | = 1.32e+00 | f = 1.39e+00
it = 644 | | f | = 1.27e+00 | f = 1.39e+00
it = 645 | | f | = 1.21e+00 | f = 1.39e+00
it = 646 | | f | = 1.16e+00 | f = 1.38e+00
it = 647 | | f | = 1.12e+00 | f = 1.38e+00
it = 648 | | f | = 1.07e+00 | f = 1.38e+00
it = 649 | | f | = 1.03e+00 | f = 1.38e+00
it = 650 | | f | = 9.90e-01 | f = 1.38e+00
it = 651 | | f | = 9.53e-01 | f = 1.38e+00
it = 652 | | f | = 9.19e-01 | f = 1.38e+00
it = 653 | | f | = 8.87e-01 | f = 1.38e+00
it = 654 | | f | = 8.58e-01 | f = 1.38e+00
it = 655 | | f | = 8.30e-01 | f = 1.38e+00
it = 656 | | f | = 8.04e-01 | f = 1.38e+00
it = 657 | | f | = 7.81e-01 | f = 1.38e+00
it = 658 | | f | = 7.59e-01 | f = 1.38e+00
it = 659 | | f | = 7.38e-01 | f = 1.38e+00
it = 660 | | f | = 1.59e+00 | f = 1.38e+00
it = 661 | | f | = 1.51e+00 | f = 1.38e+00
it = 662 | | f | = 1.44e+00 | f = 1.38e+00
it = 663 | | f | = 1.38e+00 | f = 1.38e+00
it = 664 | | f | = 1.31e+00 | f = 1.38e+00
it = 665 | | f | = 1.25e+00 | f = 1.38e+00
it = 666 | | f | = 1.20e+00 | f = 1.38e+00
it = 667 | | f | = 1.15e+00 | f = 1.38e+00
it = 668 | | f | = 1.10e+00 | f = 1.38e+00
it = 669 | | f | = 1.05e+00 | f = 1.38e+00
it = 670 | | f | = 1.01e+00 | f = 1.38e+00
it = 671 | | f | = 9.73e-01 | f = 1.38e+00
it = 672 | | f | = 9.36e-01 | f = 1.38e+00
it = 673 | | f | = 9.02e-01 | f = 1.38e+00
it = 674 | | f | = 8.70e-01 | f = 1.38e+00
it = 675 | | f | = 8.40e-01 | f = 1.38e+00
it = 676 | | f | = 8.13e-01 | f = 1.38e+00
it = 677 | | f | = 7.87e-01 | f = 1.38e+00
it = 678 | | f | = 7.64e-01 | f = 1.38e+00

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it = 679 | | f | = 7.42e-01 | f = 1.38e+00
it = 680 | | f | = 1.60e+00 | f = 1.38e+00
it = 681 | | f | = 1.52e+00 | f = 1.38e+00
it = 682 | | f | = 1.45e+00 | f = 1.38e+00
it = 683 | | f | = 1.38e+00 | f = 1.38e+00
it = 684 | | f | = 1.31e+00 | f = 1.38e+00
it = 685 | | f | = 1.25e+00 | f = 1.38e+00
it = 686 | | f | = 1.20e+00 | f = 1.38e+00
it = 687 | | f | = 1.14e+00 | f = 1.38e+00
it = 688 | | f | = 1.09e+00 | f = 1.38e+00
it = 689 | | f | = 1.05e+00 | f = 1.38e+00
it = 690 | | f | = 1.00e+00 | f = 1.38e+00
it = 691 | | f | = 9.63e-01 | f = 1.38e+00
it = 692 | | f | = 9.26e-01 | f = 1.38e+00
it = 693 | | f | = 8.91e-01 | f = 1.38e+00
it = 694 | | f | = 8.59e-01 | f = 1.38e+00
it = 695 | | f | = 8.29e-01 | f = 1.38e+00
it = 696 | | f | = 8.01e-01 | f = 1.38e+00
it = 697 | | f | = 7.76e-01 | f = 1.38e+00
it = 698 | | f | = 7.52e-01 | f = 1.38e+00
it = 699 | | f | = 1.64e+00 | f = 1.38e+00
it = 700 | | f | = 1.56e+00 | f = 1.38e+00
it = 701 | | f | = 1.48e+00 | f = 1.38e+00
it = 702 | | f | = 1.40e+00 | f = 1.38e+00
it = 703 | | f | = 1.34e+00 | f = 1.38e+00
it = 704 | | f | = 1.27e+00 | f = 1.38e+00
it = 705 | | f | = 1.21e+00 | f = 1.38e+00
it = 706 | | f | = 1.15e+00 | f = 1.38e+00
it = 707 | | f | = 1.10e+00 | f = 1.38e+00
it = 708 | | f | = 1.05e+00 | f = 1.38e+00
it = 709 | | f | = 1.01e+00 | f = 1.38e+00
it = 710 | | f | = 9.66e-01 | f = 1.38e+00
it = 711 | | f | = 9.27e-01 | f = 1.38e+00
it = 712 | | f | = 8.91e-01 | f = 1.38e+00
it = 713 | | f | = 8.57e-01 | f = 1.38e+00
it = 714 | | f | = 8.26e-01 | f = 1.38e+00
it = 715 | | f | = 7.98e-01 | f = 1.38e+00
it = 716 | | f | = 7.72e-01 | f = 1.38e+00
it = 717 | | f | = 7.48e-01 | f = 1.37e+00
it = 718 | | f | = 1.62e+00 | f = 1.37e+00
it = 719 | | f | = 1.54e+00 | f = 1.37e+00
it = 720 | | f | = 1.46e+00 | f = 1.37e+00
it = 721 | | f | = 1.38e+00 | f = 1.37e+00
it = 722 | | f | = 1.31e+00 | f = 1.37e+00
it = 723 | | f | = 1.25e+00 | f = 1.37e+00
it = 724 | | f | = 1.19e+00 | f = 1.37e+00
it = 725 | | f | = 1.13e+00 | f = 1.37e+00
it = 726 | | f | = 1.08e+00 | f = 1.37e+00

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it = 727 | | f | = 1.03e+00 | f = 1.37e+00
it = 728 | | f | = 9.84e-01 | f = 1.37e+00
it = 729 | | f | = 9.42e-01 | f = 1.37e+00
it = 730 | | f | = 9.03e-01 | f = 1.37e+00
it = 731 | | f | = 8.68e-01 | f = 1.37e+00
it = 732 | | f | = 8.35e-01 | f = 1.37e+00
it = 733 | | f | = 8.05e-01 | f = 1.37e+00
it = 734 | | f | = 7.78e-01 | f = 1.37e+00
it = 735 | | f | = 7.53e-01 | f = 1.37e+00
it = 736 | | f | = 1.64e+00 | f = 1.37e+00
it = 737 | | f | = 1.55e+00 | f = 1.37e+00
it = 738 | | f | = 1.46e+00 | f = 1.37e+00
it = 739 | | f | = 1.39e+00 | f = 1.37e+00
it = 740 | | f | = 1.31e+00 | f = 1.37e+00
it = 741 | | f | = 1.25e+00 | f = 1.37e+00
it = 742 | | f | = 1.19e+00 | f = 1.37e+00
it = 743 | | f | = 1.13e+00 | f = 1.37e+00
it = 744 | | f | = 1.07e+00 | f = 1.37e+00
it = 745 | | f | = 1.02e+00 | f = 1.37e+00
it = 746 | | f | = 9.77e-01 | f = 1.37e+00
it = 747 | | f | = 9.35e-01 | f = 1.37e+00
it = 748 | | f | = 8.96e-01 | f = 1.37e+00
it = 749 | | f | = 8.60e-01 | f = 1.37e+00
it = 750 | | f | = 8.27e-01 | f = 1.37e+00
it = 751 | | f | = 7.97e-01 | f = 1.37e+00
it = 752 | | f | = 7.69e-01 | f = 1.37e+00
it = 753 | | f | = 7.44e-01 | f = 1.37e+00
it = 754 | | f | = 1.60e+00 | f = 1.37e+00
it = 755 | | f | = 1.51e+00 | f = 1.37e+00
it = 756 | | f | = 1.43e+00 | f = 1.37e+00
it = 757 | | f | = 1.35e+00 | f = 1.37e+00
it = 758 | | f | = 1.28e+00 | f = 1.37e+00
it = 759 | | f | = 1.21e+00 | f = 1.37e+00
it = 760 | | f | = 1.15e+00 | f = 1.37e+00
it = 761 | | f | = 1.09e+00 | f = 1.37e+00
it = 762 | | f | = 1.04e+00 | f = 1.37e+00
it = 763 | | f | = 9.93e-01 | f = 1.37e+00
it = 764 | | f | = 9.48e-01 | f = 1.37e+00
it = 765 | | f | = 9.07e-01 | f = 1.37e+00
it = 766 | | f | = 8.69e-01 | f = 1.37e+00
it = 767 | | f | = 8.34e-01 | f = 1.37e+00
it = 768 | | f | = 8.02e-01 | f = 1.37e+00
it = 769 | | f | = 7.73e-01 | f = 1.37e+00
it = 770 | | f | = 7.47e-01 | f = 1.37e+00
it = 771 | | f | = 1.61e+00 | f = 1.37e+00
it = 772 | | f | = 1.52e+00 | f = 1.37e+00
it = 773 | | f | = 1.44e+00 | f = 1.37e+00
it = 774 | | f | = 1.36e+00 | f = 1.37e+00

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it = 775 | | f | = 1.28e+00 | f = 1.37e+00
it = 776 | | f | = 1.21e+00 | f = 1.37e+00
it = 777 | | f | = 1.15e+00 | f = 1.37e+00
it = 778 | | f | = 1.09e+00 | f = 1.37e+00
it = 779 | | f | = 1.04e+00 | f = 1.37e+00
it = 780 | | f | = 9.87e-01 | f = 1.37e+00
it = 781 | | f | = 9.41e-01 | f = 1.37e+00
it = 782 | | f | = 8.99e-01 | f = 1.37e+00
it = 783 | | f | = 8.61e-01 | f = 1.37e+00
it = 784 | | f | = 8.26e-01 | f = 1.37e+00
it = 785 | | f | = 7.94e-01 | f = 1.37e+00
it = 786 | | f | = 7.65e-01 | f = 1.37e+00
it = 787 | | f | = 7.39e-01 | f = 1.36e+00
it = 788 | | f | = 1.58e+00 | f = 1.36e+00
it = 789 | | f | = 1.49e+00 | f = 1.36e+00
it = 790 | | f | = 1.40e+00 | f = 1.36e+00
it = 791 | | f | = 1.32e+00 | f = 1.36e+00
it = 792 | | f | = 1.25e+00 | f = 1.36e+00
it = 793 | | f | = 1.18e+00 | f = 1.36e+00
it = 794 | | f | = 1.12e+00 | f = 1.36e+00
it = 795 | | f | = 1.06e+00 | f = 1.36e+00
it = 796 | | f | = 1.01e+00 | f = 1.36e+00
it = 797 | | f | = 9.59e-01 | f = 1.36e+00
it = 798 | | f | = 9.14e-01 | f = 1.36e+00
it = 799 | | f | = 8.73e-01 | f = 1.36e+00
it = 800 | | f | = 8.36e-01 | f = 1.36e+00
it = 801 | | f | = 8.03e-01 | f = 1.36e+00
it = 802 | | f | = 7.72e-01 | f = 1.36e+00
it = 803 | | f | = 7.45e-01 | f = 1.36e+00
it = 804 | | f | = 1.60e+00 | f = 1.36e+00
it = 805 | | f | = 1.50e+00 | f = 1.36e+00
it = 806 | | f | = 1.42e+00 | f = 1.36e+00
it = 807 | | f | = 1.33e+00 | f = 1.36e+00
it = 808 | | f | = 1.26e+00 | f = 1.36e+00
it = 809 | | f | = 1.19e+00 | f = 1.36e+00
it = 810 | | f | = 1.12e+00 | f = 1.36e+00
it = 811 | | f | = 1.06e+00 | f = 1.36e+00
it = 812 | | f | = 1.01e+00 | f = 1.36e+00
it = 813 | | f | = 9.58e-01 | f = 1.36e+00
it = 814 | | f | = 9.12e-01 | f = 1.36e+00
it = 815 | | f | = 8.71e-01 | f = 1.36e+00
it = 816 | | f | = 8.33e-01 | f = 1.36e+00
it = 817 | | f | = 7.99e-01 | f = 1.36e+00
it = 818 | | f | = 7.68e-01 | f = 1.36e+00
it = 819 | | f | = 7.40e-01 | f = 1.36e+00
it = 820 | | f | = 1.58e+00 | f = 1.36e+00
it = 821 | | f | = 1.49e+00 | f = 1.36e+00
it = 822 | | f | = 1.40e+00 | f = 1.36e+00

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it = 823 | | f | = 1.31e+00 | f = 1.36e+00
it = 824 | | f | = 1.24e+00 | f = 1.36e+00
it = 825 | | f | = 1.17e+00 | f = 1.36e+00
it = 826 | | f | = 1.10e+00 | f = 1.36e+00
it = 827 | | f | = 1.04e+00 | f = 1.36e+00
it = 828 | | f | = 9.88e-01 | f = 1.36e+00
it = 829 | | f | = 9.39e-01 | f = 1.36e+00
it = 830 | | f | = 8.94e-01 | f = 1.36e+00
it = 831 | | f | = 8.53e-01 | f = 1.36e+00
it = 832 | | f | = 8.16e-01 | f = 1.36e+00
it = 833 | | f | = 7.83e-01 | f = 1.36e+00
it = 834 | | f | = 7.53e-01 | f = 1.36e+00
it = 835 | | f | = 1.63e+00 | f = 1.36e+00
it = 836 | | f | = 1.53e+00 | f = 1.36e+00
it = 837 | | f | = 1.43e+00 | f = 1.36e+00
it = 838 | | f | = 1.34e+00 | f = 1.36e+00
it = 839 | | f | = 1.26e+00 | f = 1.36e+00
it = 840 | | f | = 1.19e+00 | f = 1.36e+00
it = 841 | | f | = 1.12e+00 | f = 1.36e+00
it = 842 | | f | = 1.06e+00 | f = 1.36e+00
it = 843 | | f | = 1.00e+00 | f = 1.36e+00
it = 844 | | f | = 9.51e-01 | f = 1.36e+00
it = 845 | | f | = 9.04e-01 | f = 1.36e+00
it = 846 | | f | = 8.61e-01 | f = 1.36e+00
it = 847 | | f | = 8.23e-01 | f = 1.36e+00
it = 848 | | f | = 7.88e-01 | f = 1.36e+00
it = 849 | | f | = 7.57e-01 | f = 1.36e+00
it = 850 | | f | = 7.29e-01 | f = 1.36e+00
it = 851 | | f | = 1.54e+00 | f = 1.36e+00
it = 852 | | f | = 1.44e+00 | f = 1.36e+00
it = 853 | | f | = 1.35e+00 | f = 1.36e+00
it = 854 | | f | = 1.27e+00 | f = 1.36e+00
it = 855 | | f | = 1.19e+00 | f = 1.36e+00
it = 856 | | f | = 1.12e+00 | f = 1.36e+00
it = 857 | | f | = 1.06e+00 | f = 1.35e+00
it = 858 | | f | = 9.99e-01 | f = 1.35e+00
it = 859 | | f | = 9.47e-01 | f = 1.35e+00
it = 860 | | f | = 8.99e-01 | f = 1.35e+00
it = 861 | | f | = 8.56e-01 | f = 1.35e+00
it = 862 | | f | = 8.17e-01 | f = 1.35e+00
it = 863 | | f | = 7.82e-01 | f = 1.35e+00
it = 864 | | f | = 7.51e-01 | f = 1.35e+00
it = 865 | | f | = 1.62e+00 | f = 1.35e+00
it = 866 | | f | = 1.51e+00 | f = 1.35e+00
it = 867 | | f | = 1.42e+00 | f = 1.35e+00
it = 868 | | f | = 1.33e+00 | f = 1.35e+00
it = 869 | | f | = 1.24e+00 | f = 1.35e+00
it = 870 | | f | = 1.17e+00 | f = 1.35e+00

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it = 871 | | f | = 1.10e+00 | f = 1.35e+00
it = 872 | | f | = 1.04e+00 | f = 1.35e+00
it = 873 | | f | = 9.78e-01 | f = 1.35e+00
it = 874 | | f | = 9.27e-01 | f = 1.35e+00
it = 875 | | f | = 8.80e-01 | f = 1.35e+00
it = 876 | | f | = 8.38e-01 | f = 1.35e+00
it = 877 | | f | = 8.00e-01 | f = 1.35e+00
it = 878 | | f | = 7.66e-01 | f = 1.35e+00
it = 879 | | f | = 7.36e-01 | f = 1.35e+00
it = 880 | | f | = 1.56e+00 | f = 1.35e+00
it = 881 | | f | = 1.46e+00 | f = 1.35e+00
it = 882 | | f | = 1.36e+00 | f = 1.35e+00
it = 883 | | f | = 1.28e+00 | f = 1.35e+00
it = 884 | | f | = 1.20e+00 | f = 1.35e+00
it = 885 | | f | = 1.12e+00 | f = 1.35e+00
it = 886 | | f | = 1.06e+00 | f = 1.35e+00
it = 887 | | f | = 9.96e-01 | f = 1.35e+00
it = 888 | | f | = 9.42e-01 | f = 1.35e+00
it = 889 | | f | = 8.93e-01 | f = 1.35e+00
it = 890 | | f | = 8.48e-01 | f = 1.35e+00
it = 891 | | f | = 8.09e-01 | f = 1.35e+00
it = 892 | | f | = 7.73e-01 | f = 1.35e+00
it = 893 | | f | = 7.42e-01 | f = 1.35e+00
it = 894 | | f | = 1.58e+00 | f = 1.35e+00
it = 895 | | f | = 1.48e+00 | f = 1.35e+00
it = 896 | | f | = 1.38e+00 | f = 1.35e+00
it = 897 | | f | = 1.29e+00 | f = 1.35e+00
it = 898 | | f | = 1.20e+00 | f = 1.35e+00
it = 899 | | f | = 1.13e+00 | f = 1.35e+00
it = 900 | | f | = 1.06e+00 | f = 1.35e+00
it = 901 | | f | = 9.99e-01 | f = 1.35e+00
it = 902 | | f | = 9.43e-01 | f = 1.35e+00
it = 903 | | f | = 8.93e-01 | f = 1.35e+00
it = 904 | | f | = 8.48e-01 | f = 1.35e+00
it = 905 | | f | = 8.07e-01 | f = 1.35e+00
it = 906 | | f | = 7.71e-01 | f = 1.35e+00
it = 907 | | f | = 7.39e-01 | f = 1.35e+00
it = 908 | | f | = 1.57e+00 | f = 1.35e+00
it = 909 | | f | = 1.46e+00 | f = 1.35e+00
it = 910 | | f | = 1.36e+00 | f = 1.35e+00
it = 911 | | f | = 1.27e+00 | f = 1.35e+00
it = 912 | | f | = 1.19e+00 | f = 1.35e+00
it = 913 | | f | = 1.12e+00 | f = 1.35e+00
it = 914 | | f | = 1.05e+00 | f = 1.35e+00
it = 915 | | f | = 9.86e-01 | f = 1.35e+00
it = 916 | | f | = 9.30e-01 | f = 1.35e+00
it = 917 | | f | = 8.80e-01 | f = 1.35e+00
it = 918 | | f | = 8.36e-01 | f = 1.35e+00

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it = 919 | | f | = 7.96e-01 | f = 1.35e+00
it = 920 | | f | = 7.61e-01 | f = 1.35e+00
it = 921 | | f | = 7.29e-01 | f = 1.35e+00
it = 922 | | f | = 1.53e+00 | f = 1.35e+00
it = 923 | | f | = 1.43e+00 | f = 1.35e+00
it = 924 | | f | = 1.33e+00 | f = 1.35e+00
it = 925 | | f | = 1.24e+00 | f = 1.35e+00
it = 926 | | f | = 1.16e+00 | f = 1.35e+00
it = 927 | | f | = 1.08e+00 | f = 1.34e+00
it = 928 | | f | = 1.02e+00 | f = 1.34e+00
it = 929 | | f | = 9.58e-01 | f = 1.34e+00
it = 930 | | f | = 9.05e-01 | f = 1.34e+00
it = 931 | | f | = 8.57e-01 | f = 1.34e+00
it = 932 | | f | = 8.14e-01 | f = 1.34e+00
it = 933 | | f | = 7.76e-01 | f = 1.34e+00
it = 934 | | f | = 7.42e-01 | f = 1.34e+00
it = 935 | | f | = 1.58e+00 | f = 1.34e+00
it = 936 | | f | = 1.47e+00 | f = 1.34e+00
it = 937 | | f | = 1.36e+00 | f = 1.34e+00
it = 938 | | f | = 1.27e+00 | f = 1.34e+00
it = 939 | | f | = 1.18e+00 | f = 1.34e+00
it = 940 | | f | = 1.11e+00 | f = 1.34e+00
it = 941 | | f | = 1.04e+00 | f = 1.34e+00
it = 942 | | f | = 9.75e-01 | f = 1.34e+00
it = 943 | | f | = 9.19e-01 | f = 1.34e+00
it = 944 | | f | = 8.68e-01 | f = 1.34e+00
it = 945 | | f | = 8.23e-01 | f = 1.34e+00
it = 946 | | f | = 7.84e-01 | f = 1.34e+00
it = 947 | | f | = 7.48e-01 | f = 1.34e+00
it = 948 | | f | = 1.61e+00 | f = 1.34e+00
it = 949 | | f | = 1.49e+00 | f = 1.34e+00
it = 950 | | f | = 1.38e+00 | f = 1.34e+00
it = 951 | | f | = 1.28e+00 | f = 1.34e+00
it = 952 | | f | = 1.19e+00 | f = 1.34e+00
it = 953 | | f | = 1.11e+00 | f = 1.34e+00
it = 954 | | f | = 1.04e+00 | f = 1.34e+00
it = 955 | | f | = 9.79e-01 | f = 1.34e+00
it = 956 | | f | = 9.21e-01 | f = 1.34e+00
it = 957 | | f | = 8.70e-01 | f = 1.34e+00
it = 958 | | f | = 8.24e-01 | f = 1.34e+00
it = 959 | | f | = 7.83e-01 | f = 1.34e+00
it = 960 | | f | = 7.48e-01 | f = 1.34e+00
it = 961 | | f | = 1.60e+00 | f = 1.34e+00
it = 962 | | f | = 1.48e+00 | f = 1.34e+00
it = 963 | | f | = 1.37e+00 | f = 1.34e+00
it = 964 | | f | = 1.28e+00 | f = 1.34e+00
it = 965 | | f | = 1.19e+00 | f = 1.34e+00
it = 966 | | f | = 1.11e+00 | f = 1.34e+00

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it = 967 | | f| = 1.03e+00 | f = 1.34e+00
it = 968 | | f| = 9.70e-01 | f = 1.34e+00
it = 969 | | f| = 9.12e-01 | f = 1.34e+00
it = 970 | | f| = 8.61e-01 | f = 1.34e+00
it = 971 | | f| = 8.15e-01 | f = 1.34e+00
it = 972 | | f| = 7.75e-01 | f = 1.34e+00
it = 973 | | f| = 7.40e-01 | f = 1.34e+00
it = 974 | | f| = 1.57e+00 | f = 1.34e+00
it = 975 | | f| = 1.45e+00 | f = 1.34e+00
it = 976 | | f| = 1.34e+00 | f = 1.34e+00
it = 977 | | f| = 1.25e+00 | f = 1.34e+00
it = 978 | | f| = 1.16e+00 | f = 1.34e+00
it = 979 | | f| = 1.08e+00 | f = 1.34e+00
it = 980 | | f| = 1.01e+00 | f = 1.34e+00
it = 981 | | f| = 9.48e-01 | f = 1.34e+00
it = 982 | | f| = 8.92e-01 | f = 1.34e+00
it = 983 | | f| = 8.42e-01 | f = 1.34e+00
it = 984 | | f| = 7.98e-01 | f = 1.34e+00
it = 985 | | f| = 7.59e-01 | f = 1.34e+00
it = 986 | | f| = 7.26e-01 | f = 1.34e+00
it = 987 | | f| = 1.52e+00 | f = 1.34e+00
it = 988 | | f| = 1.40e+00 | f = 1.34e+00
it = 989 | | f| = 1.30e+00 | f = 1.34e+00
it = 990 | | f| = 1.20e+00 | f = 1.34e+00
it = 991 | | f| = 1.12e+00 | f = 1.34e+00
it = 992 | | f| = 1.04e+00 | f = 1.34e+00
it = 993 | | f| = 9.76e-01 | f = 1.34e+00
it = 994 | | f| = 9.16e-01 | f = 1.34e+00
it = 995 | | f| = 8.62e-01 | f = 1.34e+00
it = 996 | | f| = 8.15e-01 | f = 1.33e+00
it = 997 | | f| = 7.74e-01 | f = 1.33e+00
it = 998 | | f| = 7.38e-01 | f = 1.33e+00
it = 999 | | f| = 1.56e+00 | f = 1.33e+00

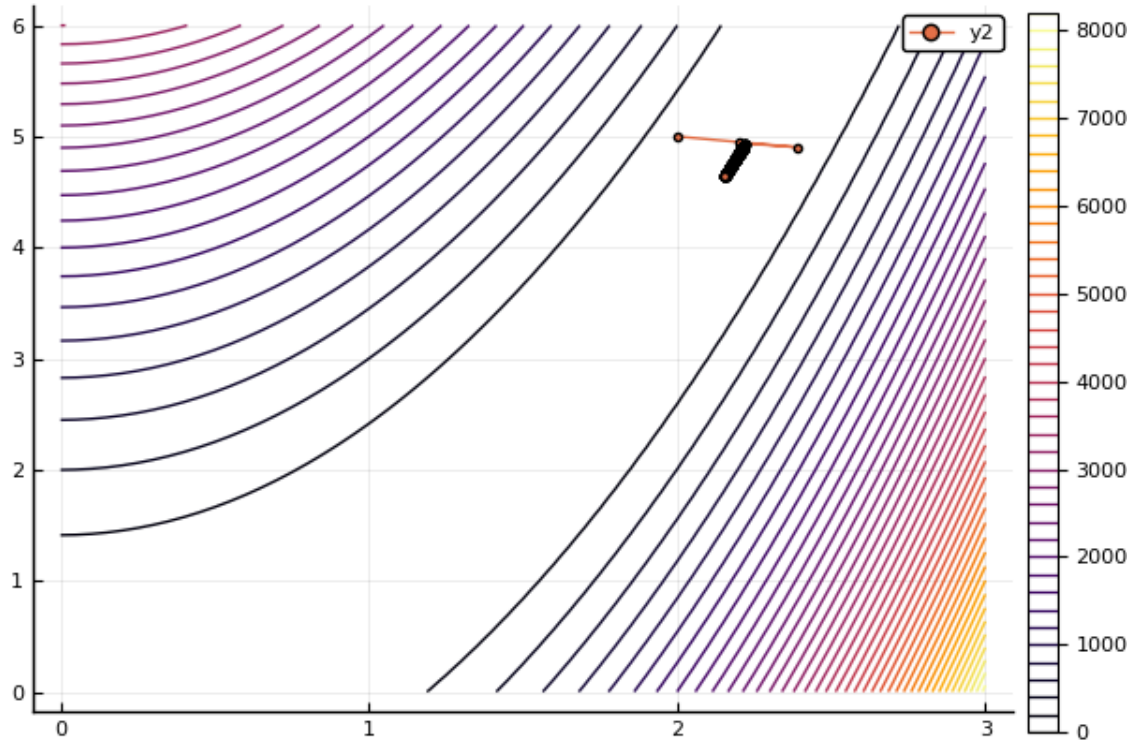
```

```

[167]: f(x1,x2) = 100(x2-x1^2)^2+(1-x1)^2
x1 = 0:0.05:3
x2 = 0:0.05:6
contour(x1, x2, f, levels = 50)
plot!(xtrace[:,1],xtrace[:,2],marker = 3)

```

[167]:



```
[200]: f(x) = 100(x[2]-x[1]^2)^2+(1-x[1])^2
Hf(x) = ForwardDiff.hessian(f,x)
xmin = [1,1];
```

```
[229]: # compute inverse of hessian using eigenvalue decomposition

F = eigen(Hf(xmin))
Λinv = diagm(1 ./ F.values)
Q = F.vectors

Hf(xmin)*Q*Λinv*Q'
```

```
[229]: 2×2 Array{Float64,2}:
 1.0      1.27343e-13
 4.44089e-15 1.0
```

```
[ ]:
```