5.2.4 Exam: Application of gradient descent to minimize required power

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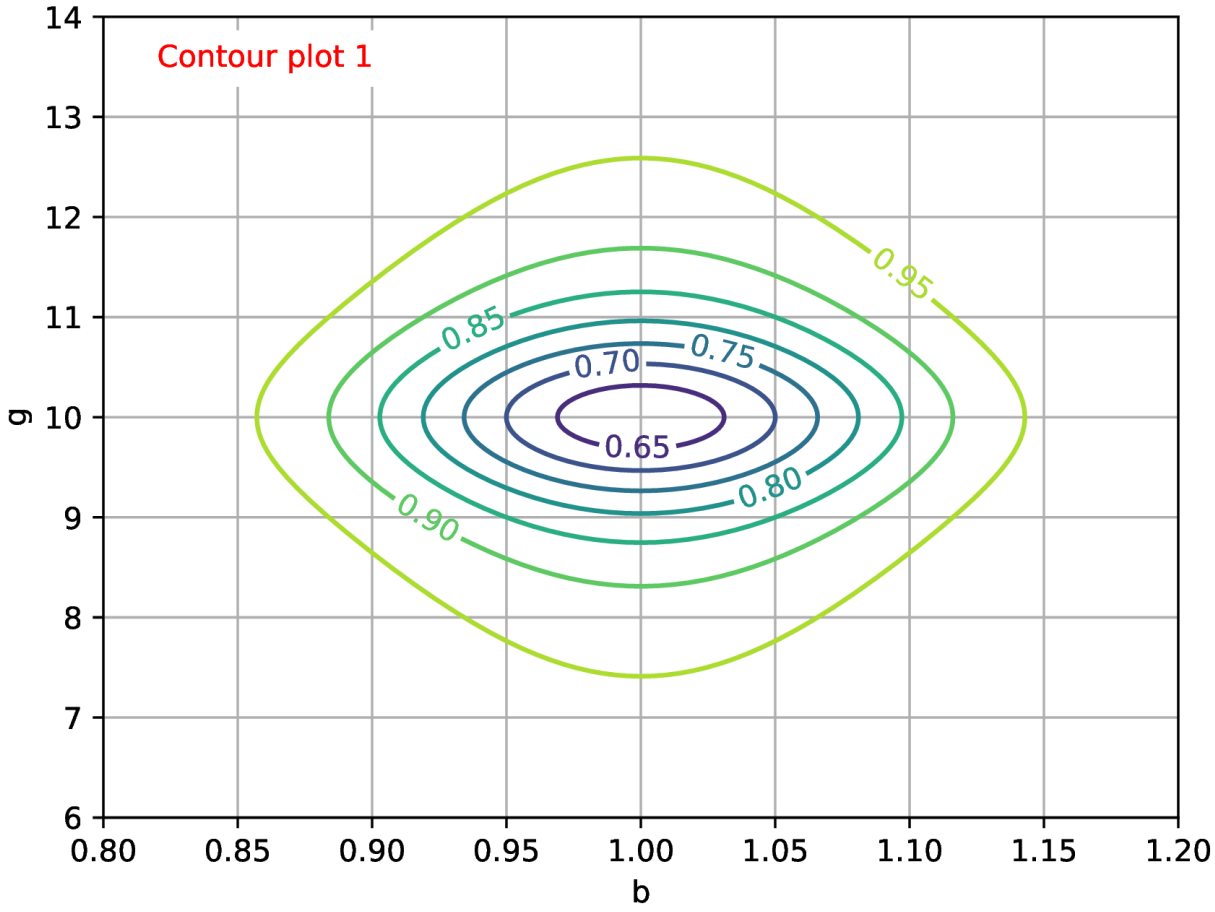
Exams due Sep 27, 2023 05:00 IST Completed

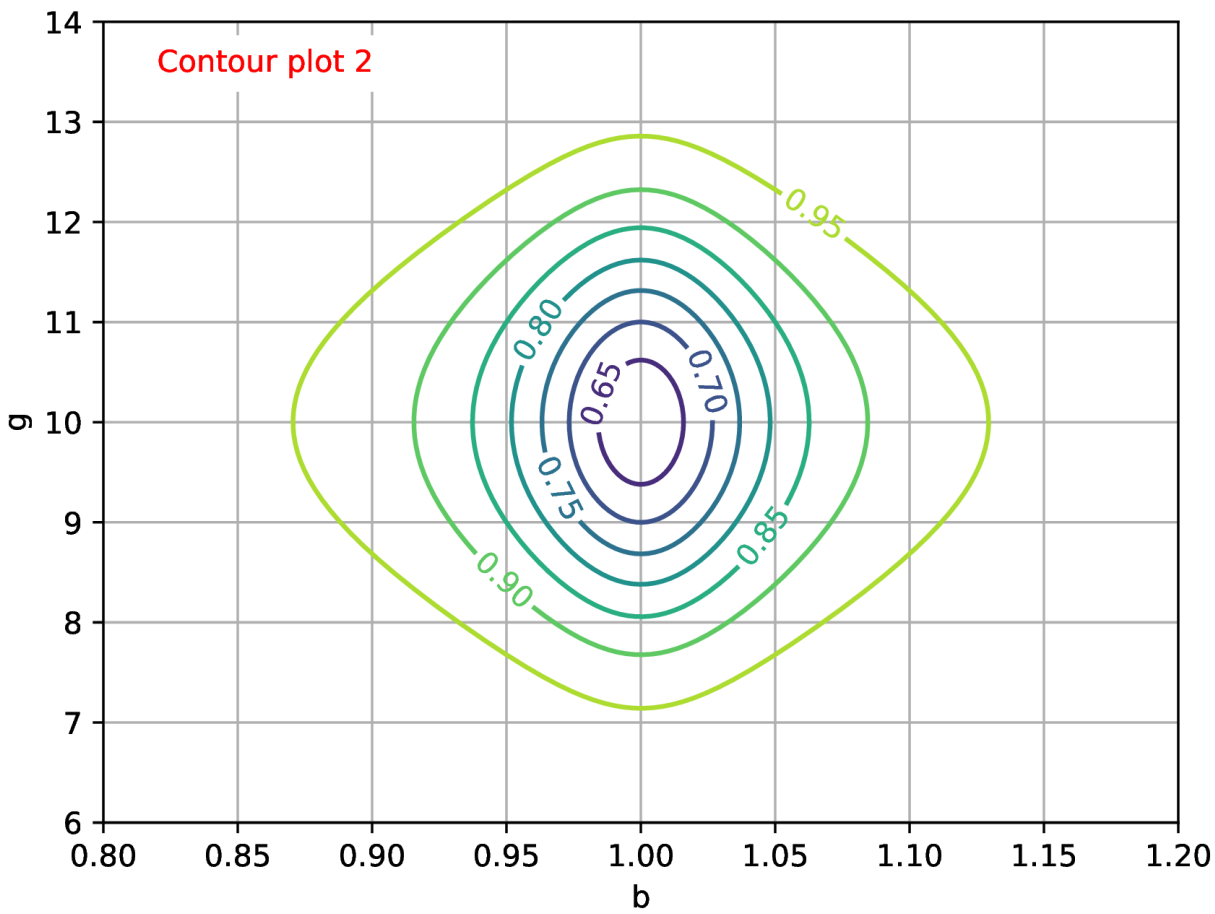
A new refrigeration system is being designed to minimize the power required to operate it. Suppose the system is a function of two design parameters, b and g. We have implemented a Python function `reqpow` which calculates the required power given the values of b and g, as well as calculates the gradient of the required power with respect to b and g. A file with that function implemented is available here.

Problem: Identify contour plots

1.0/1.0 point (graded)

Which of the following contour plots of the required power is correct?





Select your answer:

Contour plot 1

Contour plot 1

Contour plot 2

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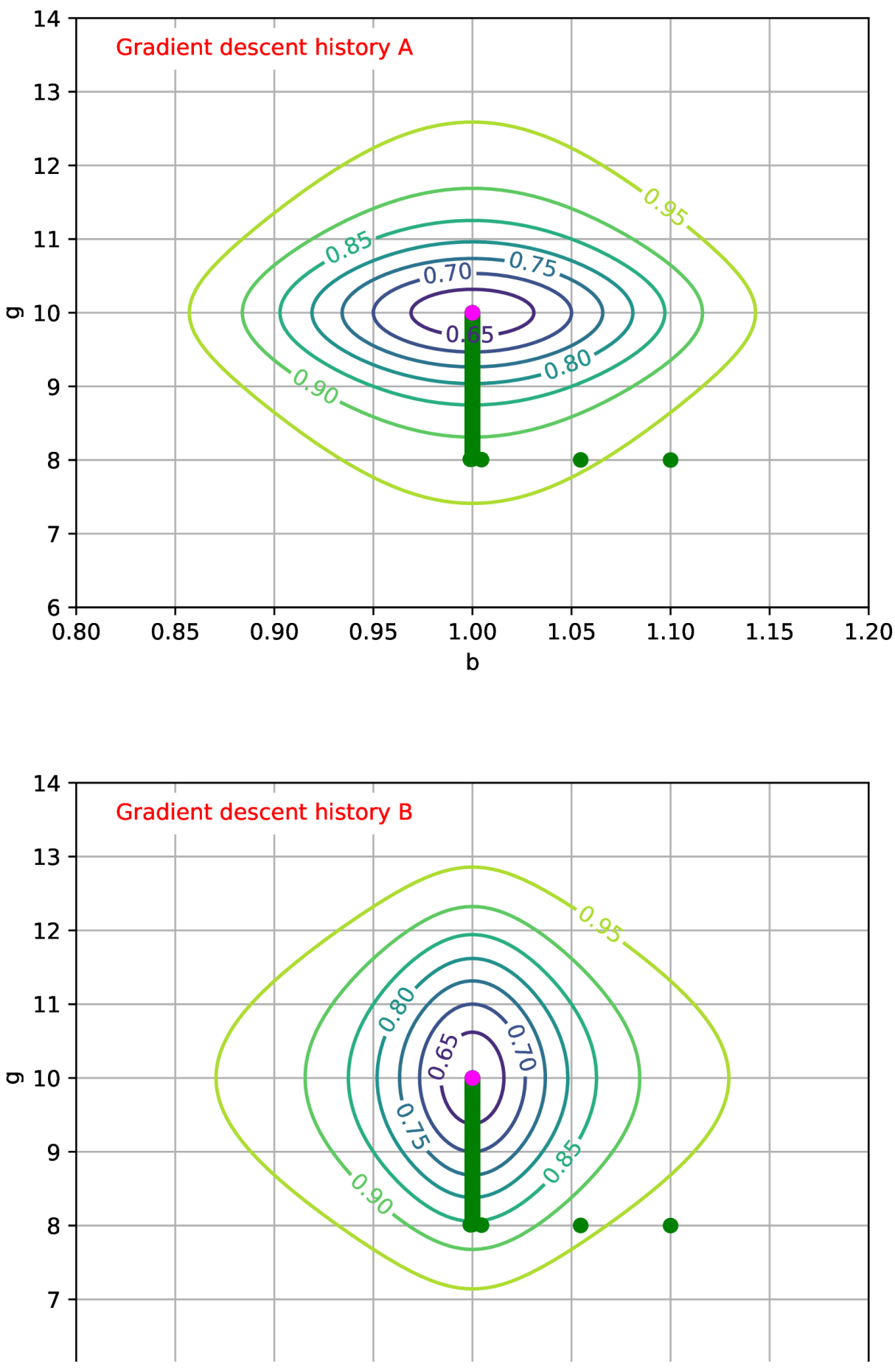
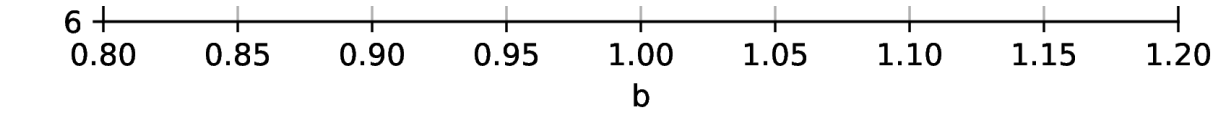
Answers are displayed within the problem

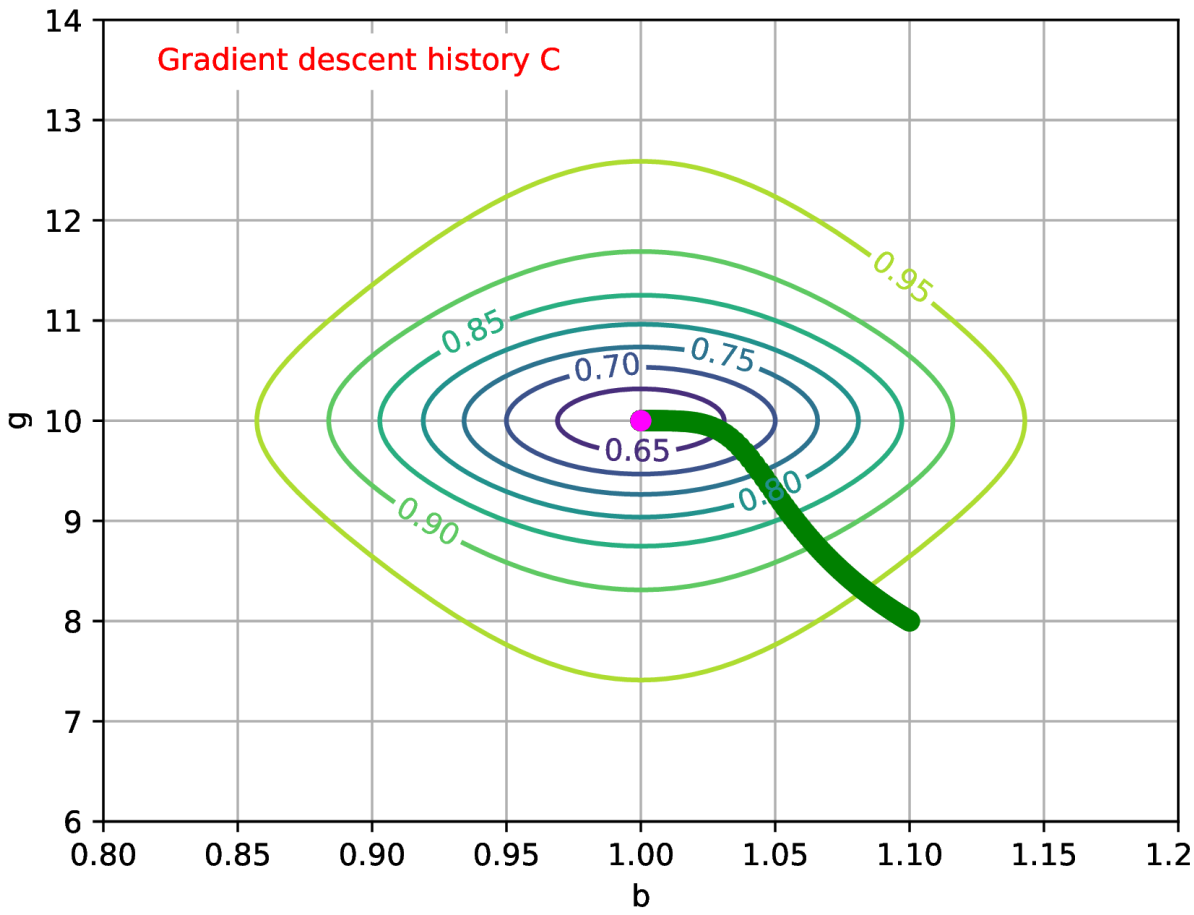
Problem: Identify gradient descent history

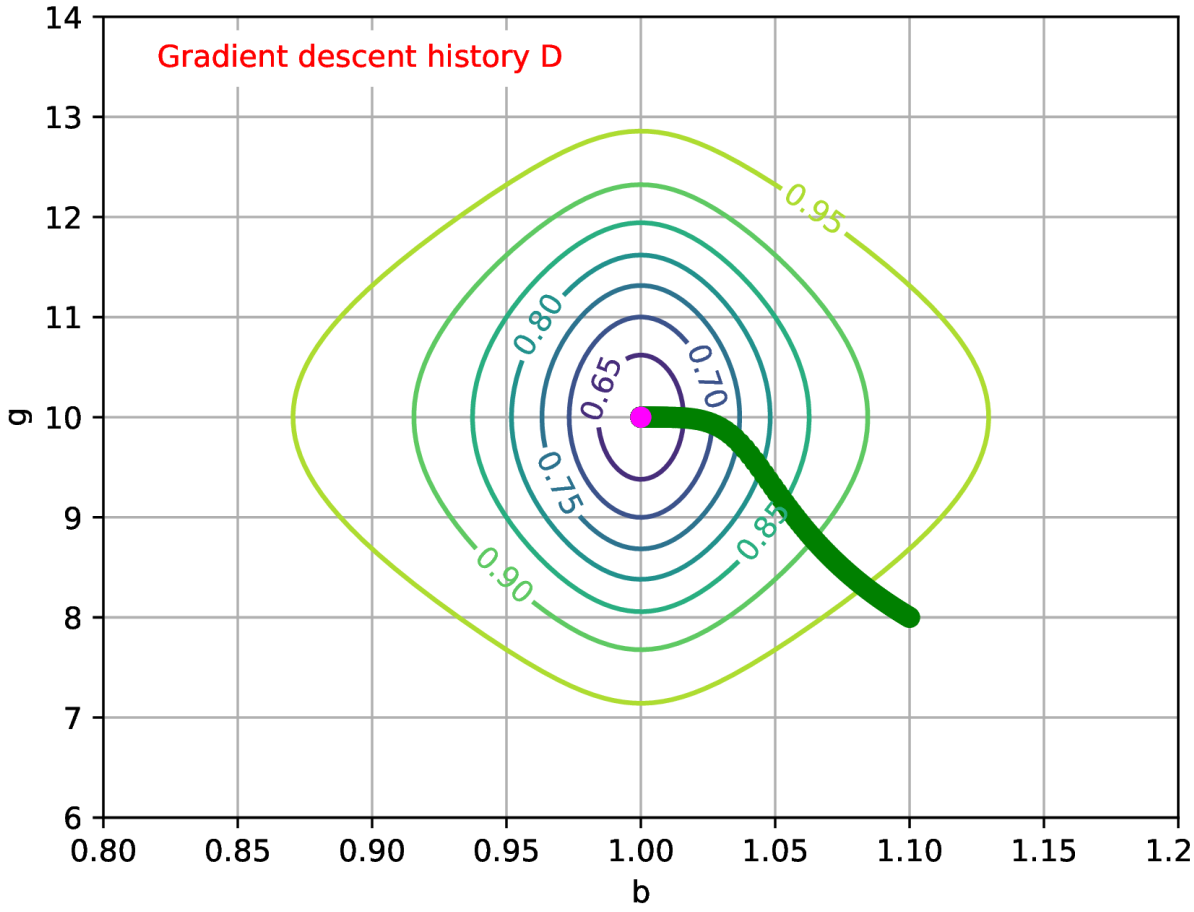
2.0/2.0 points (graded)

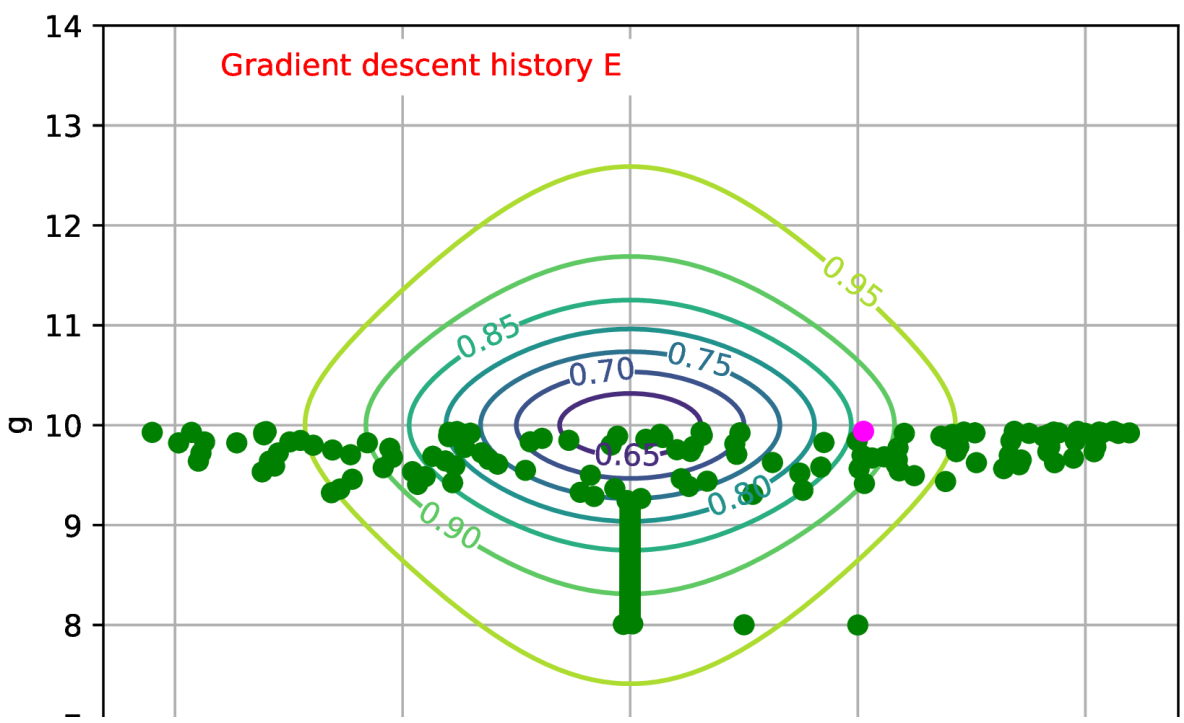
Consider the application of gradient descent to find the minimum required power. Let the starting guess be $b = 1.10$ and $g = 8.0$ and the step size $\alpha = 0.08$. Which of the following plots is a correct plot of the gradient descent history (including having the correct contours)? Note: the value of $\alpha = 0.08$ is not guaranteed to be stable! Hint: consider writing Python code to implement gradient descent on this problem and identify the correct plot.

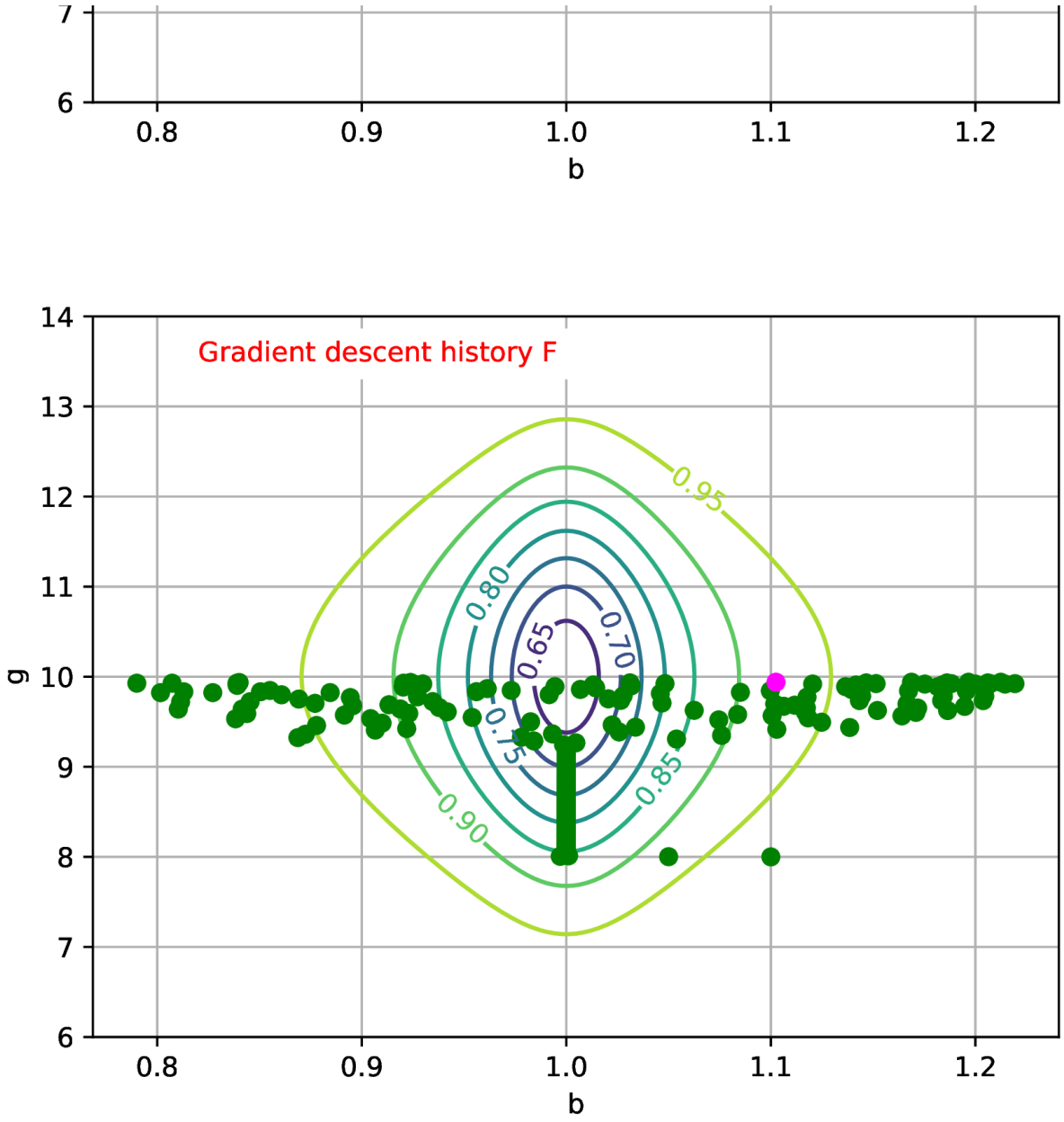



6
0.80
0.85
0.90
0.95
1.00
1.05
1.10
1.15
1.20
b


Gradient descent history C
14
13
12
11
10
9
8
7
6
g
0.95
0.85
0.70
0.75
0.65
0.90
0.80
0.80
0.85
0.90
1.00
1.05
1.10
1.15
1.20
b


Gradient descent history D
14
13
12
11
10
9
8
7
6
g
0.95
0.80
0.65
0.70
0.75
0.85
0.90
0.80
0.85
0.90
1.00
1.05
1.10
1.15
1.20
b


Gradient descent history E
14
13
12
11
10
9
8
g
0.95
0.85
0.70
0.75
0.65
0.80
0.90



Select your answer:

- (●) Gradient descent history A
- ( ) Gradient descent history B
- ( ) Gradient descent history C
- ( ) Gradient descent history D
- ( ) Gradient descent history E
- ( ) Gradient descent history F

✔

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Answers are displayed within the problem

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