1. (35 points) An open-loop transfer function is given by,
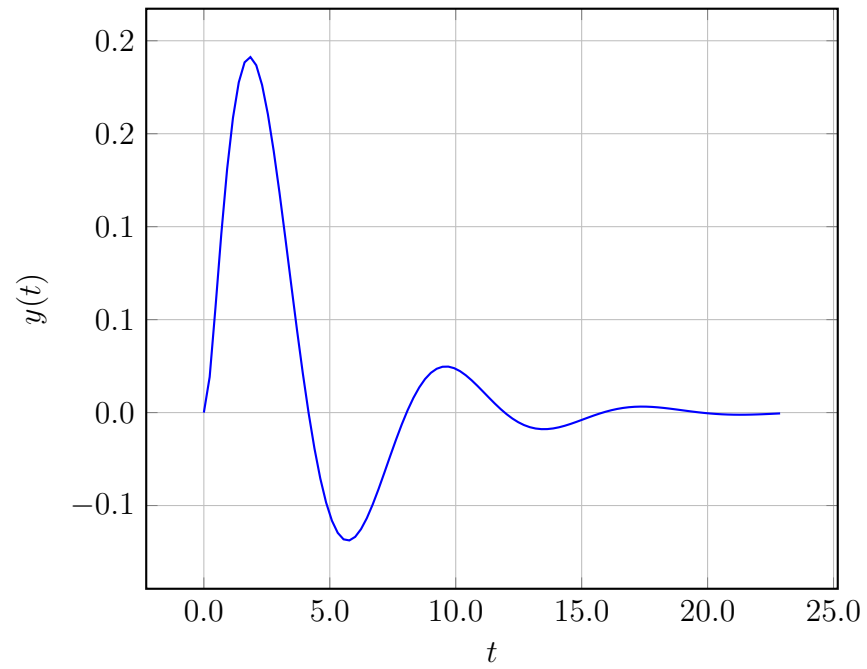
$$G(s) = \frac{1}{s^3 + 2.0s^2 + 3.34848s + 7.34848}$$

Which of the following PI controllers stabilizes the system in a unit-feedback closed-loop configuration?
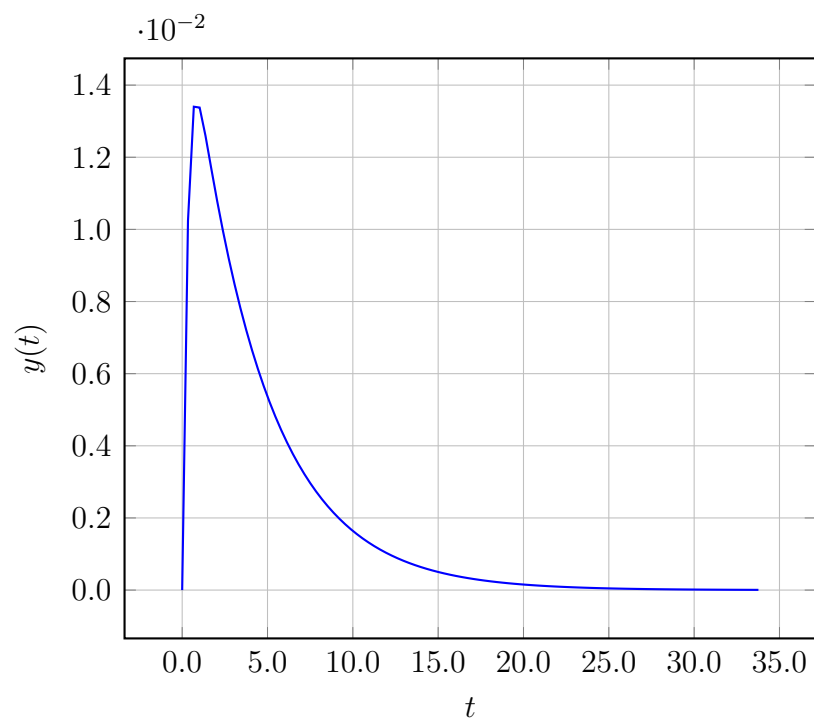
A. $F(s) = -3.19696 + \frac{0.84848}{s}$

B. $F(s) = -8.60606 + \frac{1.69696}{s}$

C. $F(s) = 2.5909 + \frac{1.69696}{s}$

D. $F(s) = -7.9091 + \frac{3.19696}{s}$

E. $F(s) = 1.89394 + \frac{3.19696}{s}$

2. (35 points) Which one of the following unit impulse responses corresponds to a system that does not overshoot when subjected to a unit step input?
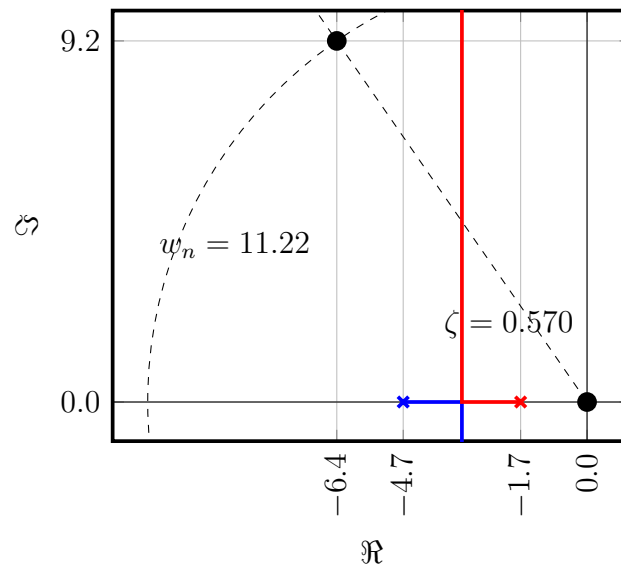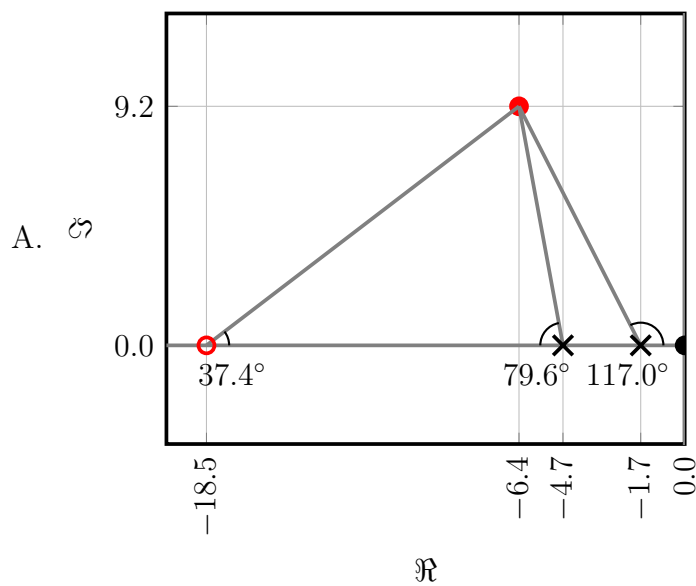
A.

B.

3. (30 points) A design point on the root-locus plot for a P-type controller is shown below.
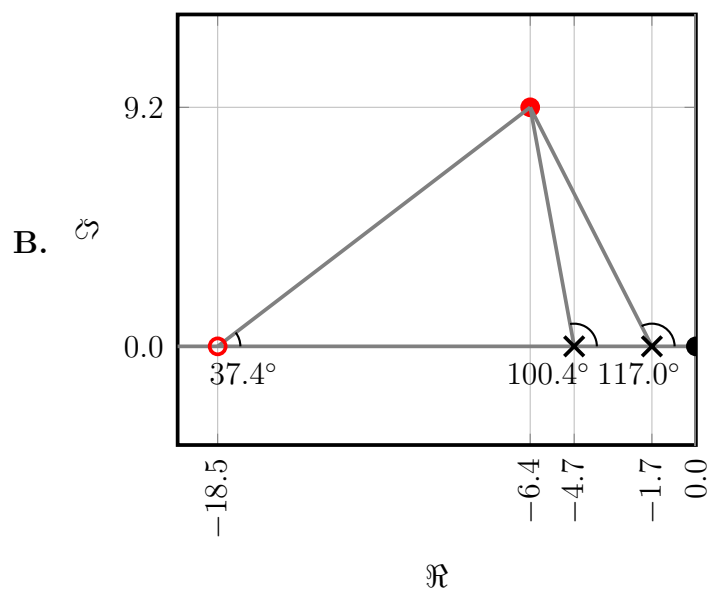

A zero is added so that the root-locus passes through this design point. Which of the following represents the correct angle condition for this design?
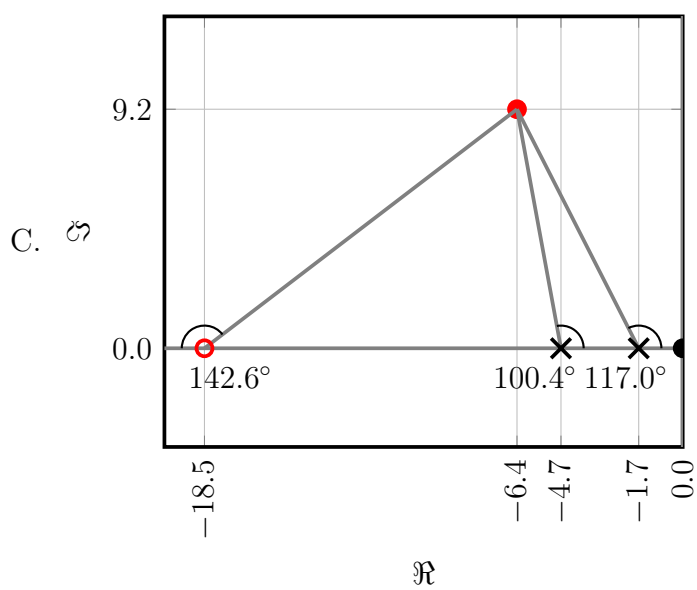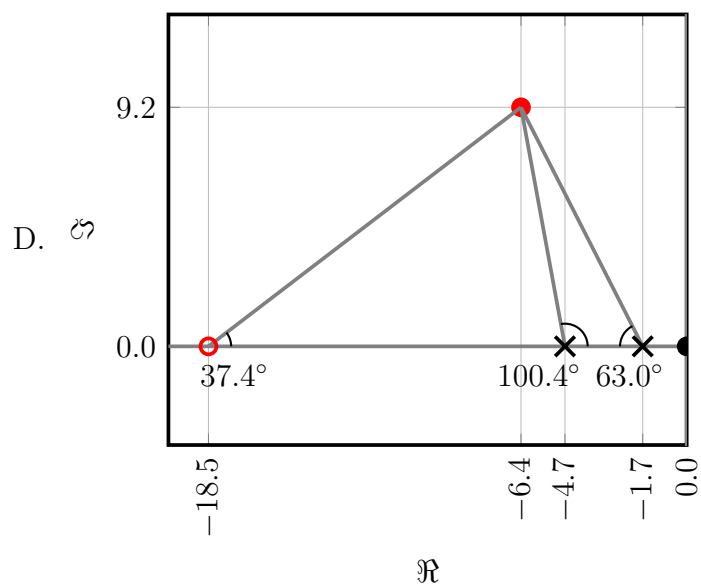
$$\sum \theta = 117.0° + 79.6° + 37.4° = 234.0°$$

A.

$$\sum \theta = 117.0°+100.4°-37.4° = 180.0°$$

$$\sum \theta = 117.0°+100.4°+142.6° = 360.0°$$

$$\sum \theta = 63.0° + 100.4° + 37.4° = 200.8°$$

D.

Q	A
1	A
2	B
3	B