1. (35 points) An open-loop transfer function is given by,

$$G(s) = \frac{1}{s^3 + 2.0s^2 + 3.19191s + 7.19191}$$

Which of the following PI controllers stabilizes the system in a unit-feedback closed-loop configuration?

A. $F(s) = 1.26767 + \frac{2.88383}{s}$

B. $F(s) = -2.88383 + \frac{0.69191}{s}$

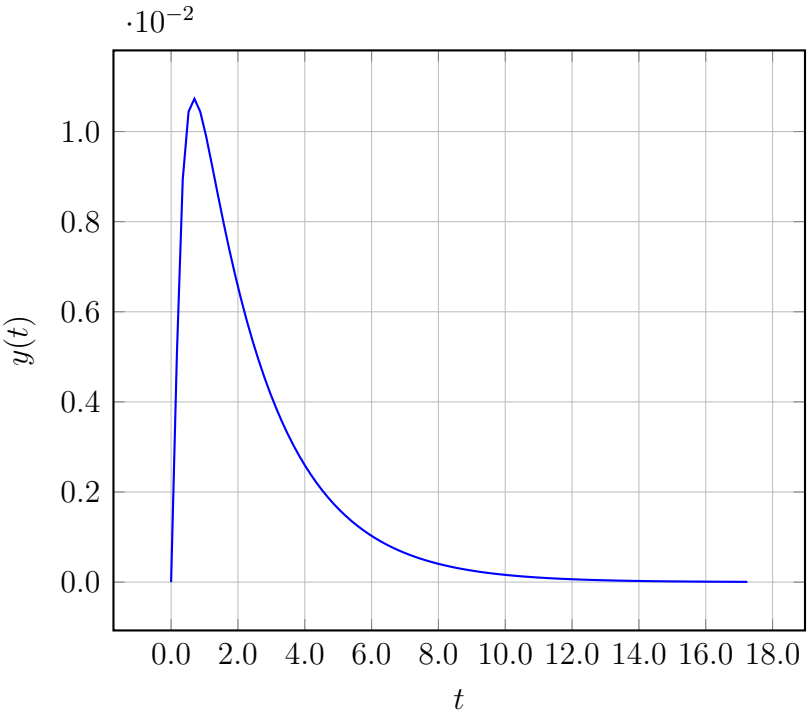
C. $F(s) = -8.8485 + \frac{2.88383}{s}$

D. $F(s) = -9.23233 + \frac{1.38383}{s}$

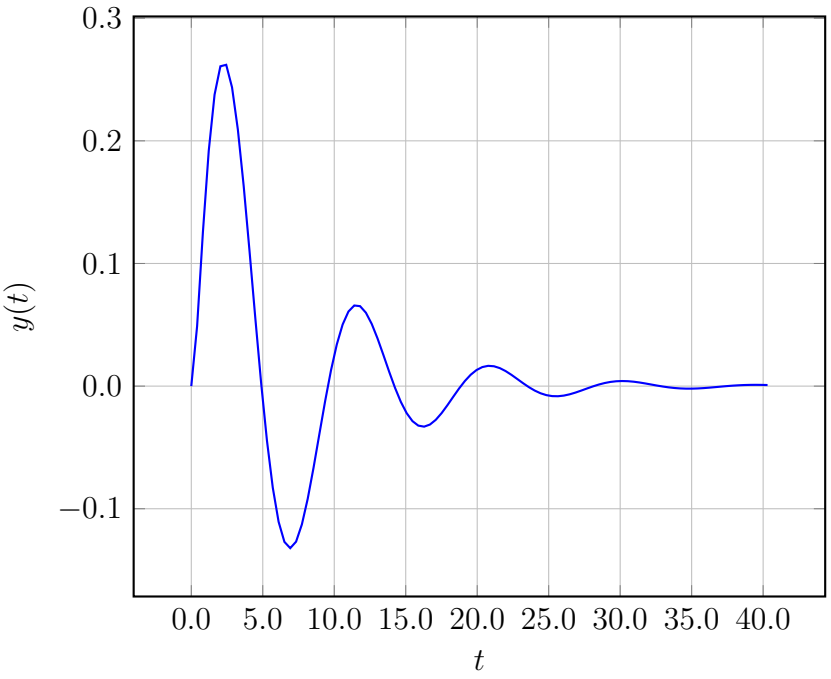
E. $F(s) = 1.6515 + \frac{1.38383}{s}$

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?

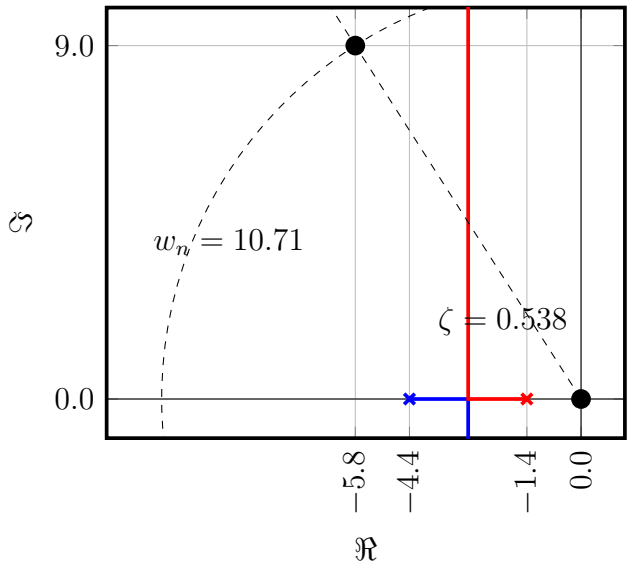
A.



B.



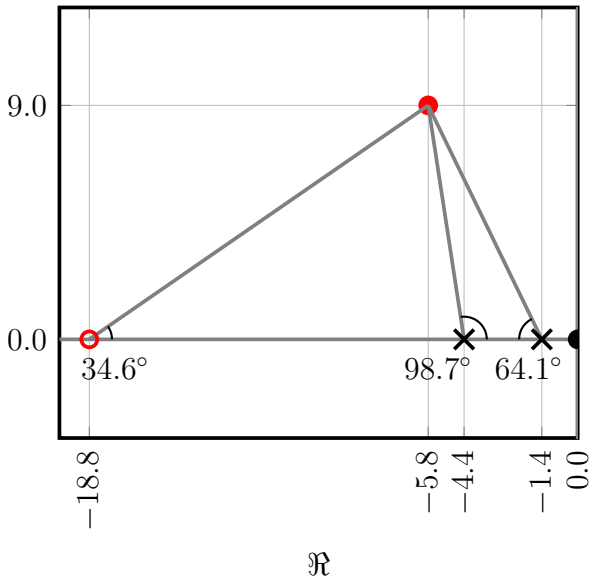
3. (30 points) A design point on the root-locus plot for a P-type controller is shown below.



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?

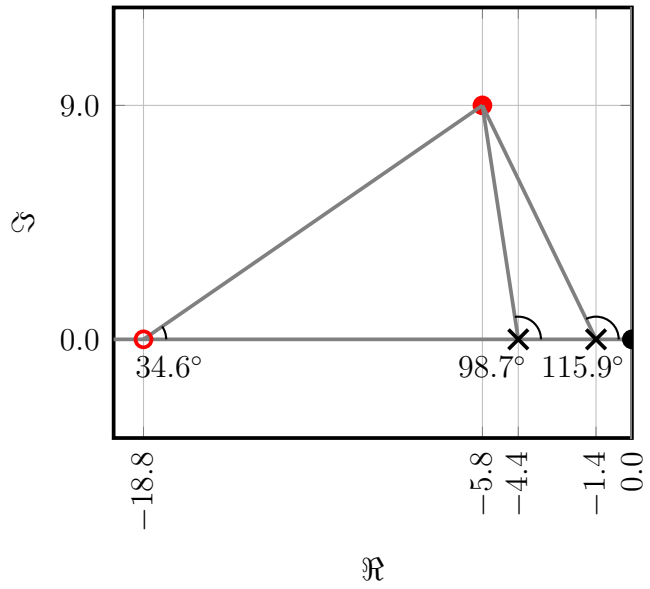
$$\sum \theta = 64.1^\circ + 98.7^\circ + 34.6^\circ = 197.4^\circ$$

A.



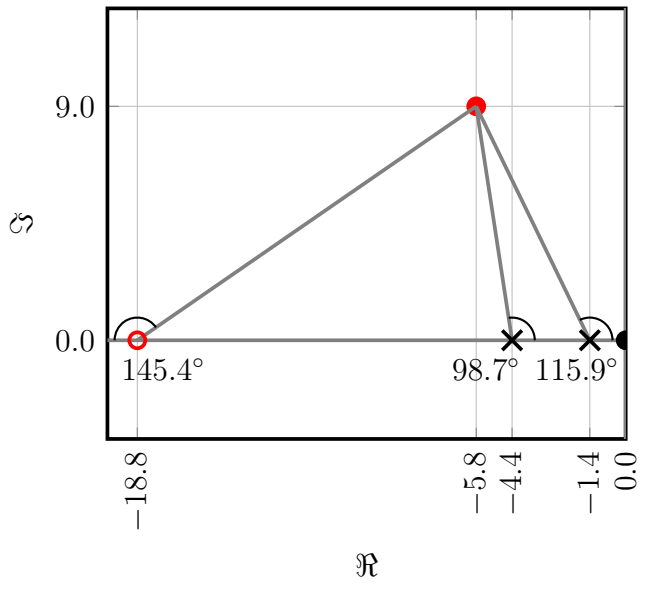
$$\sum \theta = 115.9° + 98.7° - 34.6° = 180.0°$$

B.



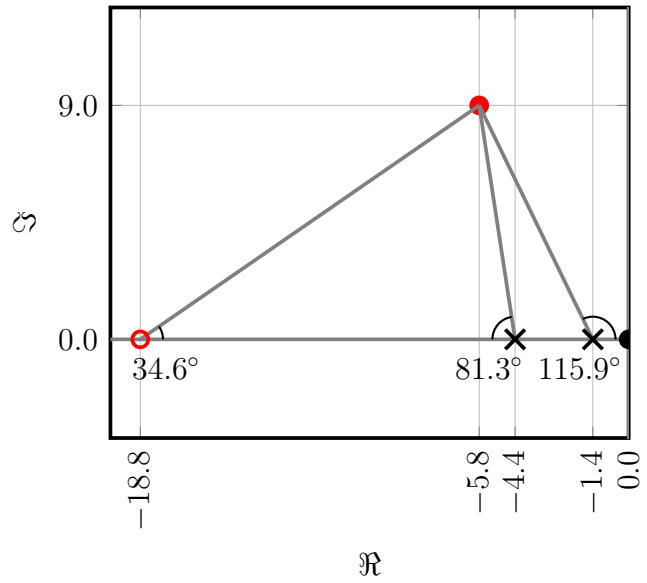
$$\sum \theta = 115.9° + 98.7° + 145.4° = 360.0°$$

C.



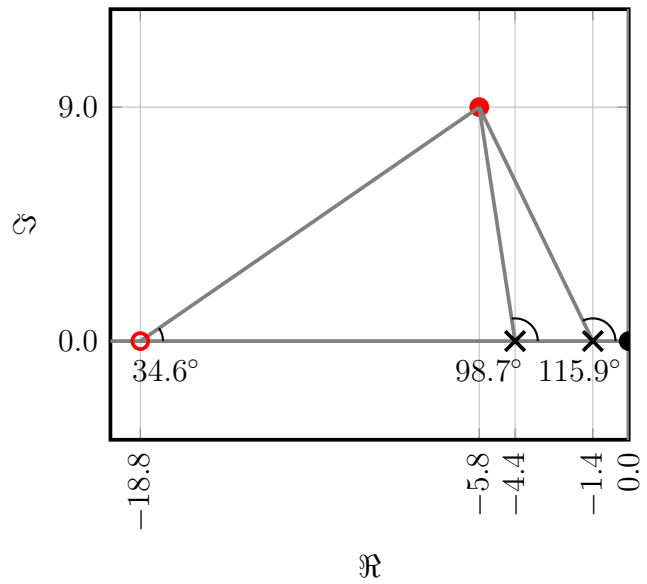
$$\sum \theta = 115.9° + 81.3° + 34.6° = 231.8°$$

D.



$$\sum \theta = 115.9° + 98.7° + 34.6° = 249.2°$$

E.



Q	A
1	B
2	A
3	B