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

$$G(s) = \frac{1}{s^3 + 2.0s^2 + 3.09595s + 7.09595}$$

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

A. $F(s) = -2.69191 + \frac{0.59595}{s}$

B. $F(s) = -9.42426 + \frac{2.69191}{s}$

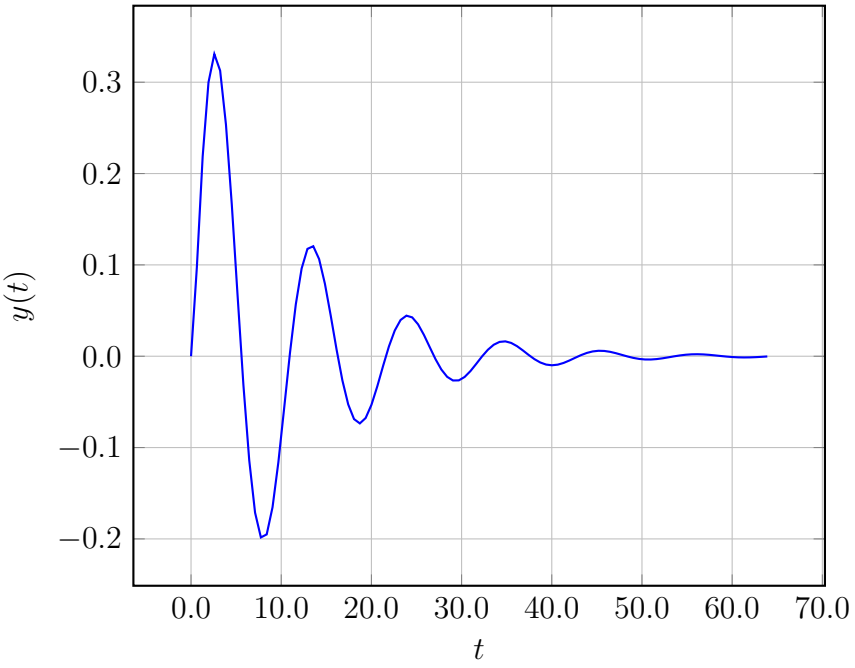
C. $F(s) = 1.07574 + \frac{1.19191}{s}$

D. $F(s) = 0.88383 + \frac{2.69191}{s}$

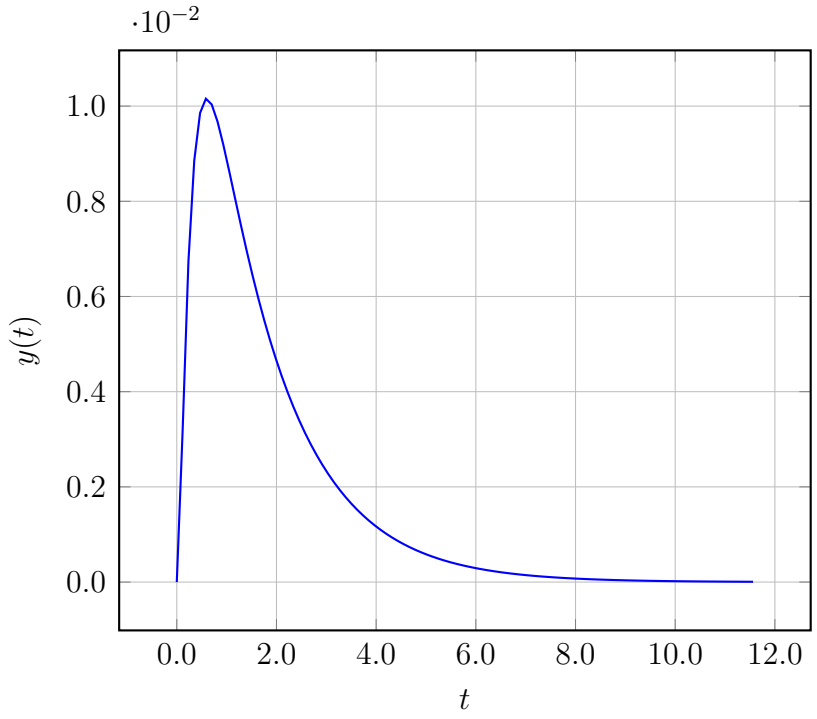
E. $F(s) = -9.61617 + \frac{1.19191}{s}$

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?

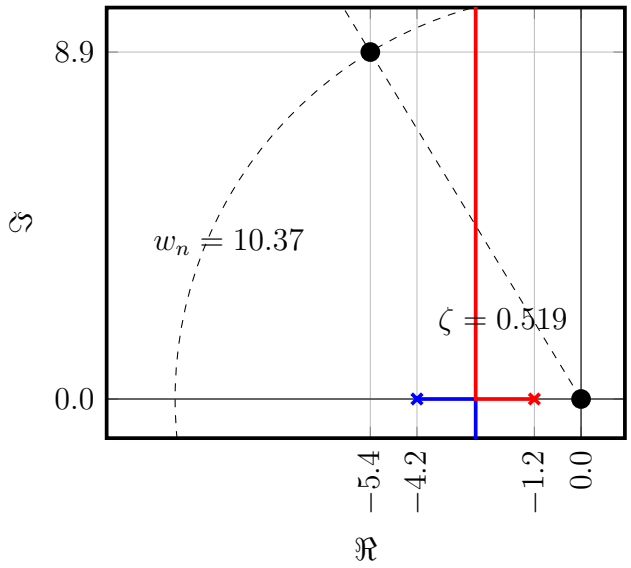
A.



B.



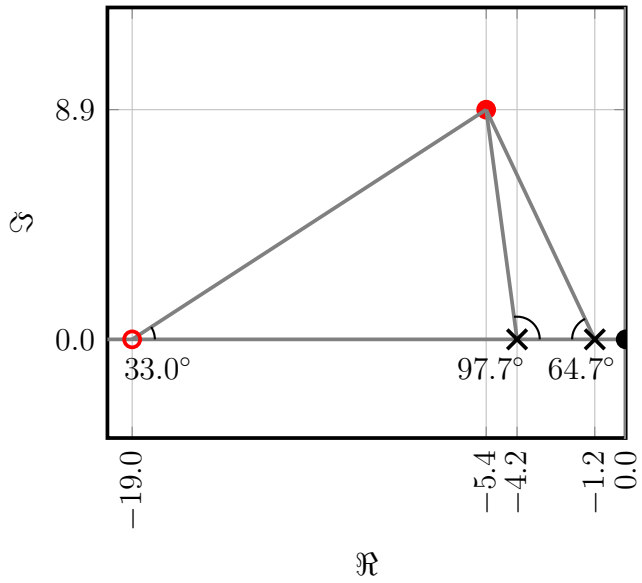
3. (30 points) A design point on the root-locus plot for a P-type controller is shown below.



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?

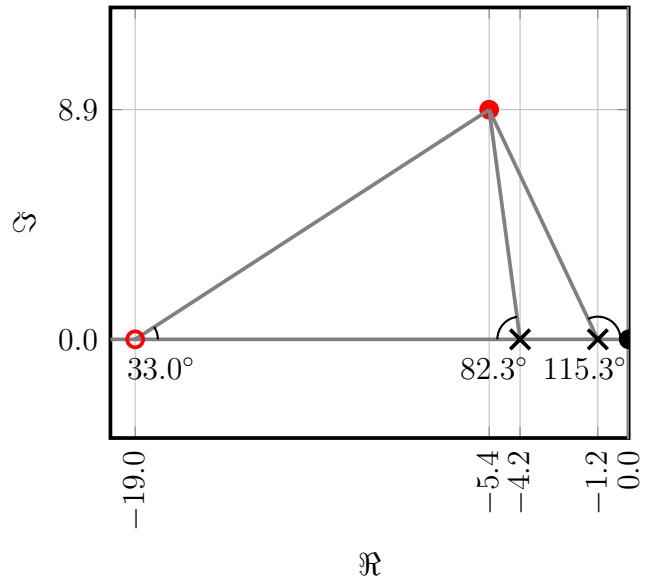
$$\sum \theta = 64.7^\circ + 97.7^\circ + 33.0^\circ = 195.3^\circ$$

A.



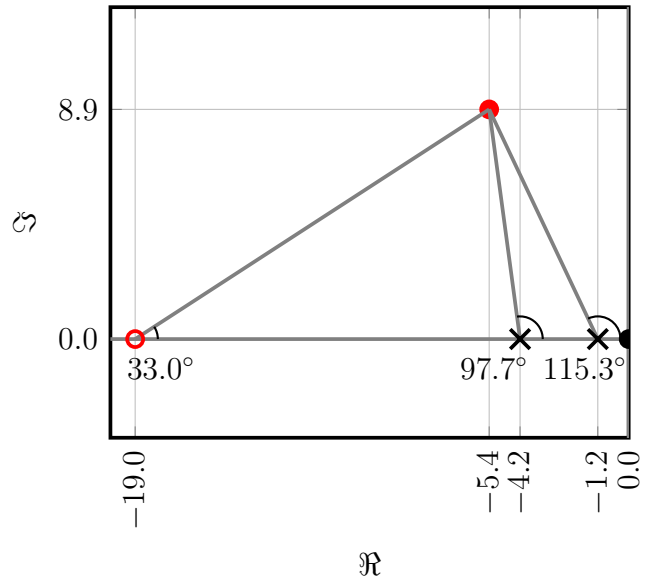
$$\sum \theta = 115.3^\circ + 82.3^\circ + 33.0^\circ = 230.6^\circ$$

B.



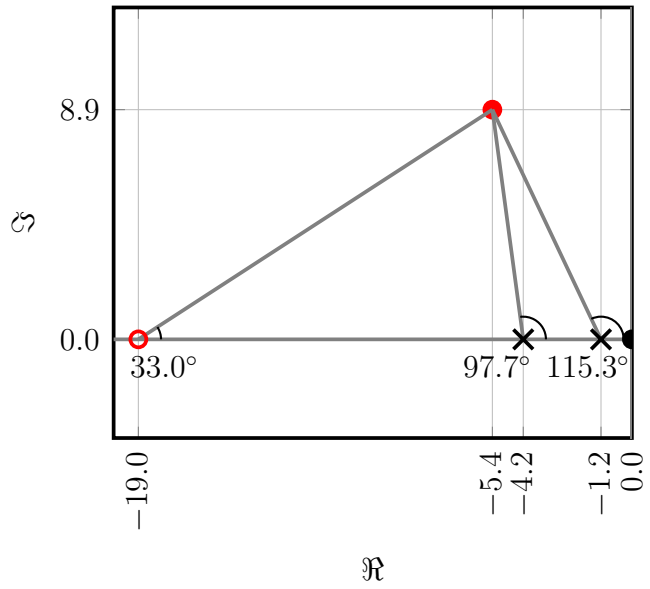
$$\sum \theta = 115.3^\circ + 97.7^\circ + 33.0^\circ = 245.9^\circ$$

C.



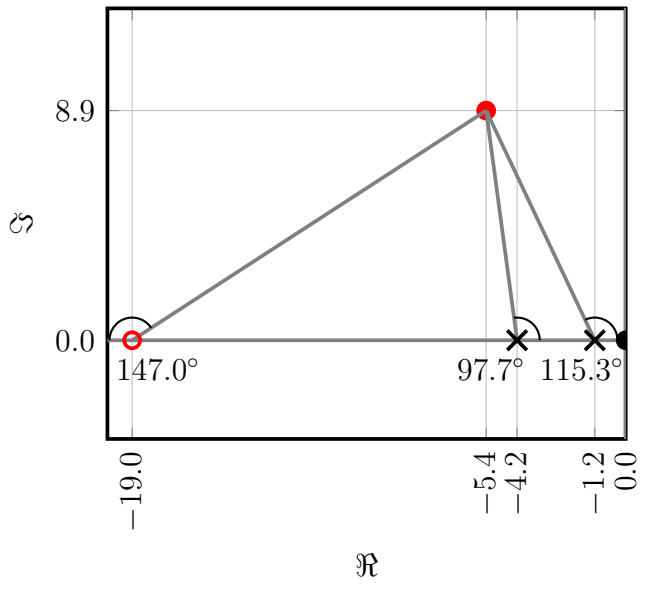
$$\sum \theta = 115.3° + 97.7° - 33.0° = 180.0°$$

D.



$$\sum \theta = 115.3° + 97.7° + 147.0° = 360.0°$$

E.



Q	A
1	A
2	B
3	D