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

$$G(s) = \frac{1}{s^3 + 2.0s^2 + 3.08585s + 7.08585}$$

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

A. $F(s) = -9.48486 + \frac{2.6717}{s}$

B. $F(s) = -2.6717 + \frac{0.58585}{s}$

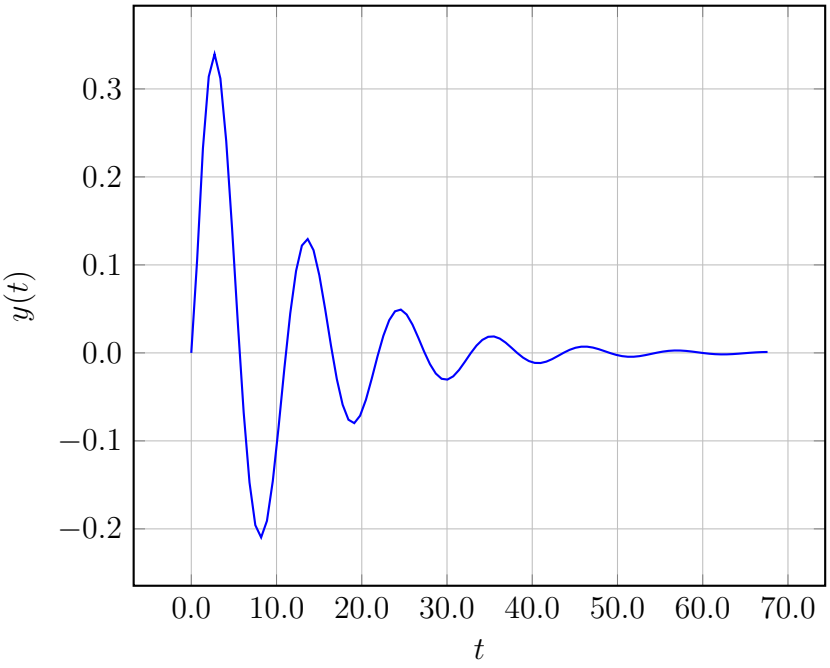
C. $F(s) = -9.65657 + \frac{1.1717}{s}$

D. $F(s) = 0.84343 + \frac{2.6717}{s}$

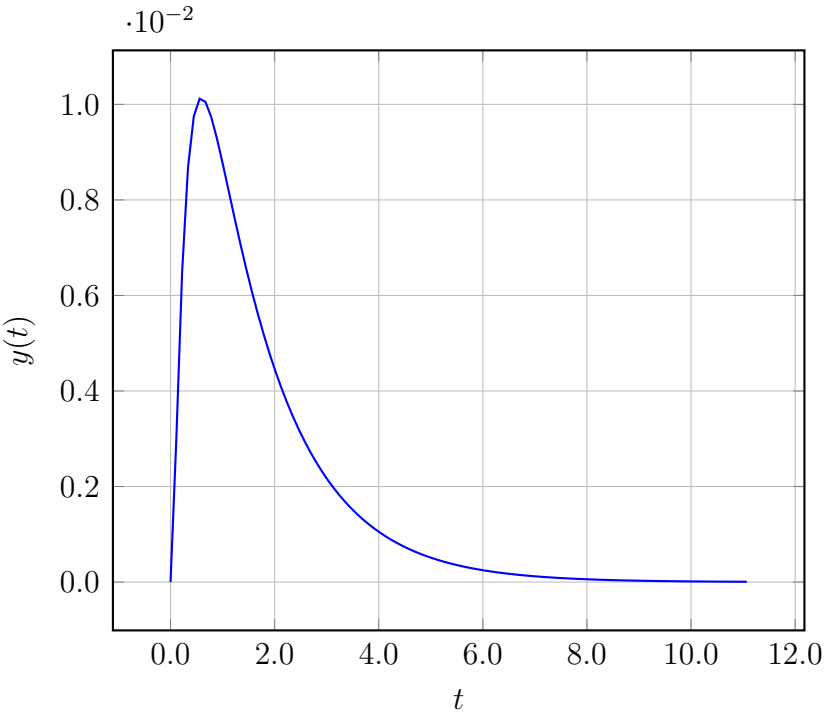
E. $F(s) = 1.01514 + \frac{1.1717}{s}$

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?

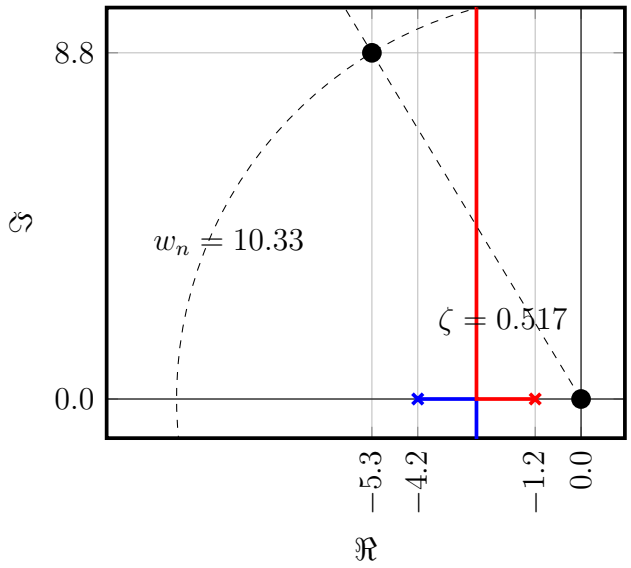
A.



B.



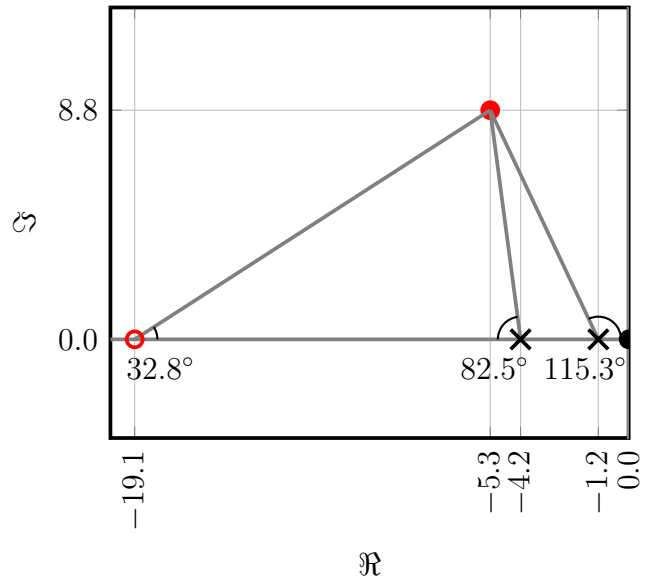
3. (30 points) A design point on the root-locus plot for a P-type controller is shown below.



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?

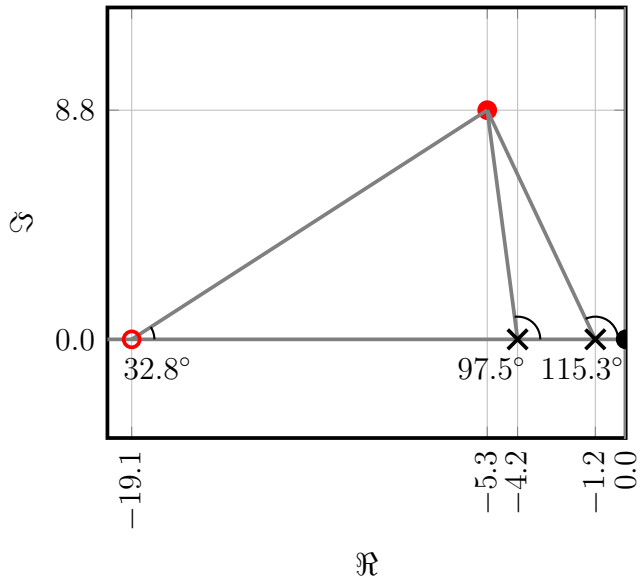
$$\sum \theta = 115.3^\circ + 82.5^\circ + 32.8^\circ = 230.5^\circ$$

A.



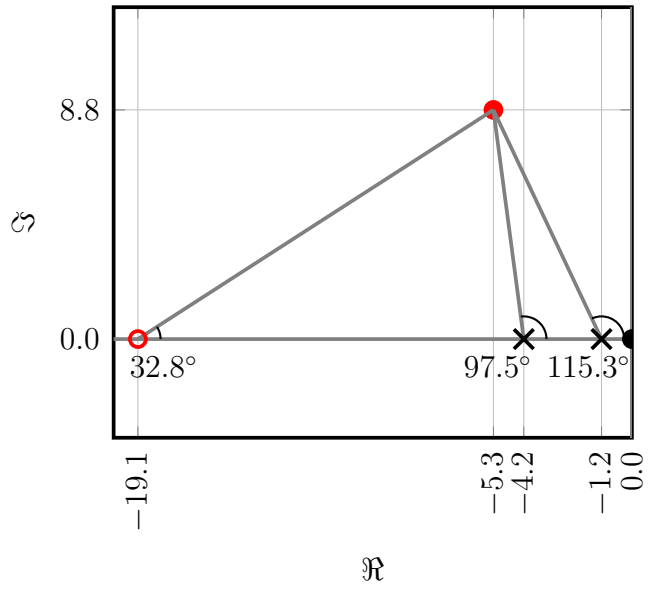
$$\sum \theta = 115.3^\circ + 97.5^\circ + 32.8^\circ = 245.6^\circ$$

B.



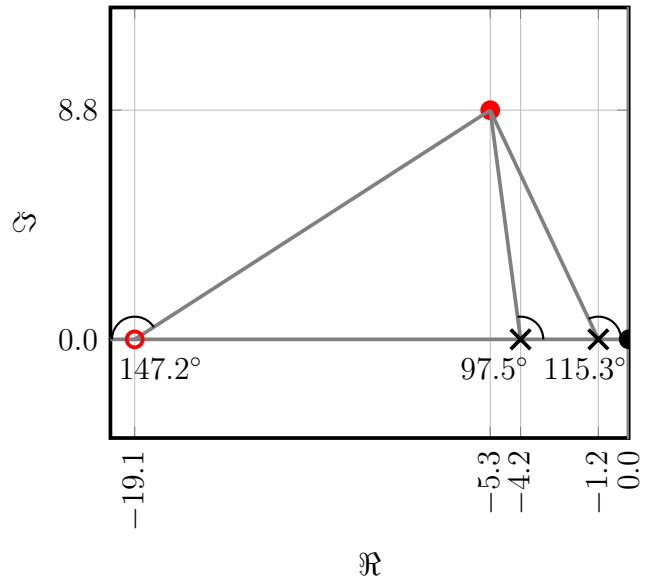
$$\sum \theta = 115.3^\circ + 97.5^\circ - 32.8^\circ = 180.0^\circ$$

C.



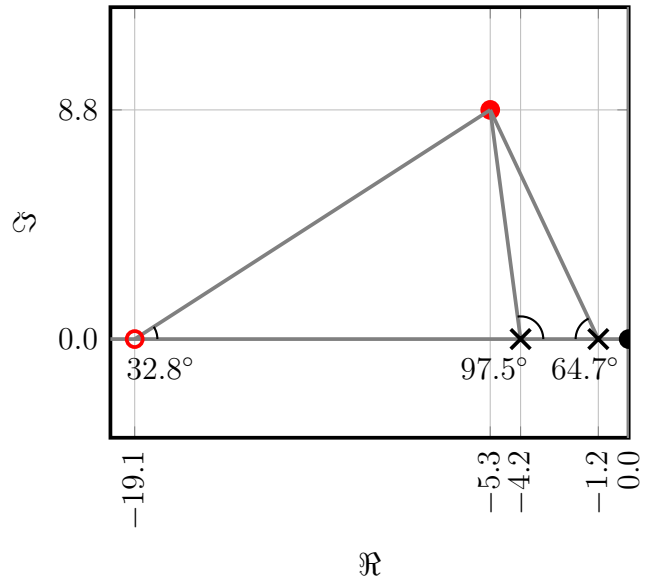
$$\sum \theta = 115.3^\circ + 97.5^\circ + 147.2^\circ = 360.0^\circ$$

D.



$$\sum \theta = 64.7^\circ + 97.5^\circ + 32.8^\circ = 195.1^\circ$$

E.



Q	A
1	B
2	B
3	C