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

$$G(s) = \frac{1}{s^3 + 2.0s^2 + 3.0808s + 7.0808}$$

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

A. $F(s) = -9.67677 + \frac{1.1616}{s}$

B. $F(s) = 0.98485 + \frac{1.1616}{s}$

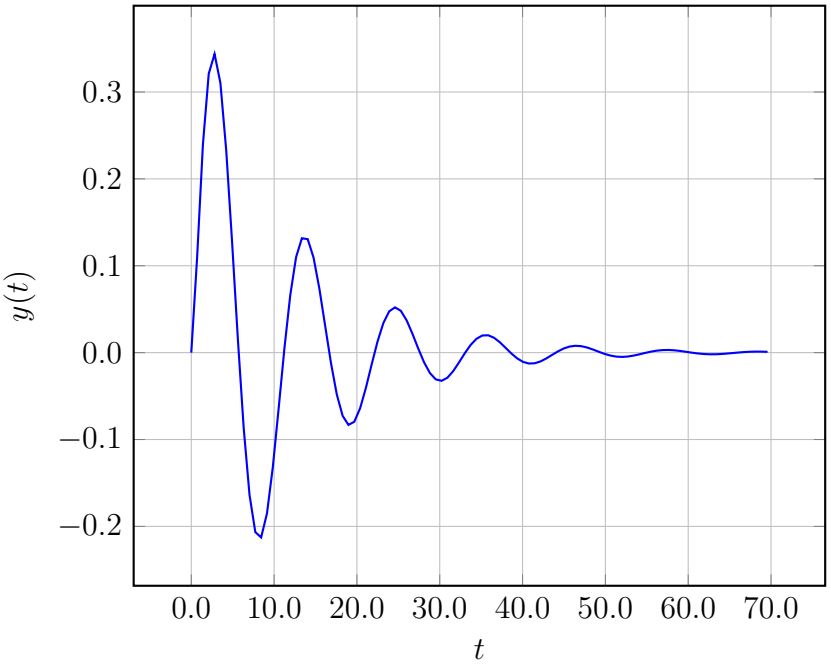
C. $F(s) = -9.51515 + \frac{2.6616}{s}$

D. $F(s) = -2.6616 + \frac{0.5808}{s}$

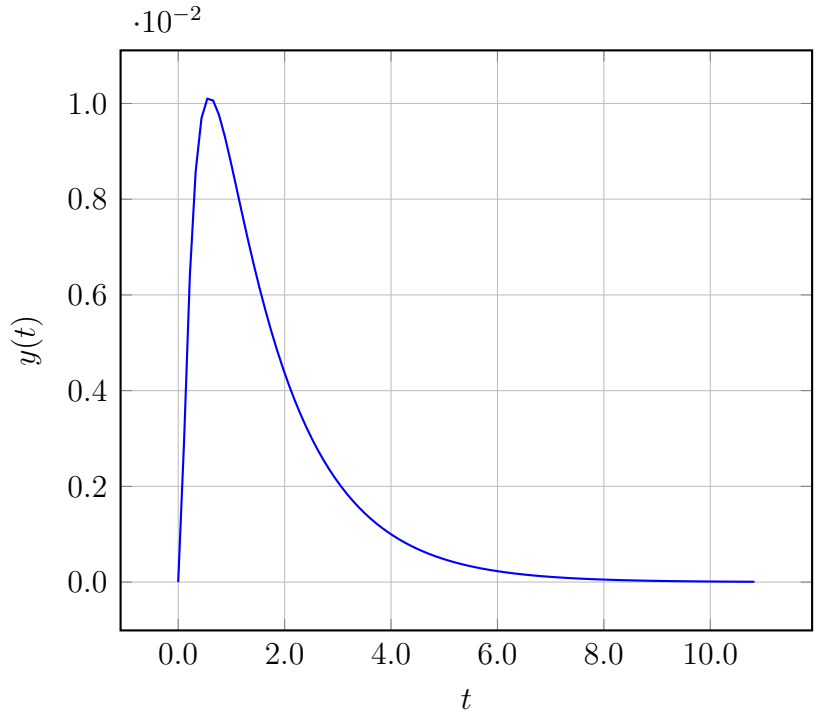
E. $F(s) = 0.82323 + \frac{2.6616}{s}$

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?

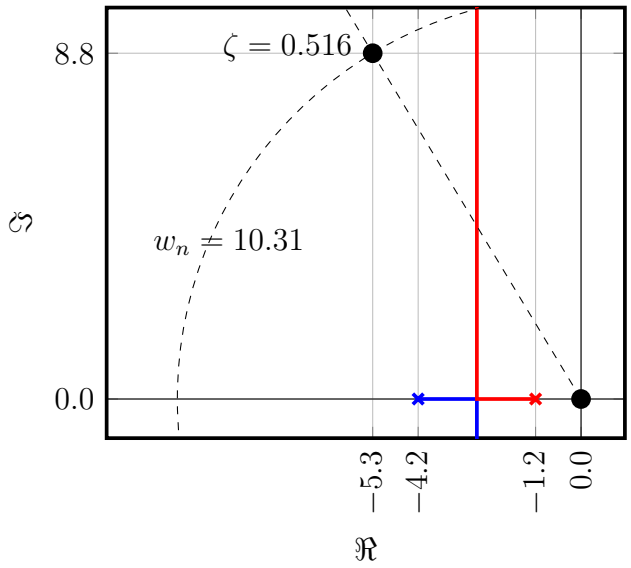
A.



B.

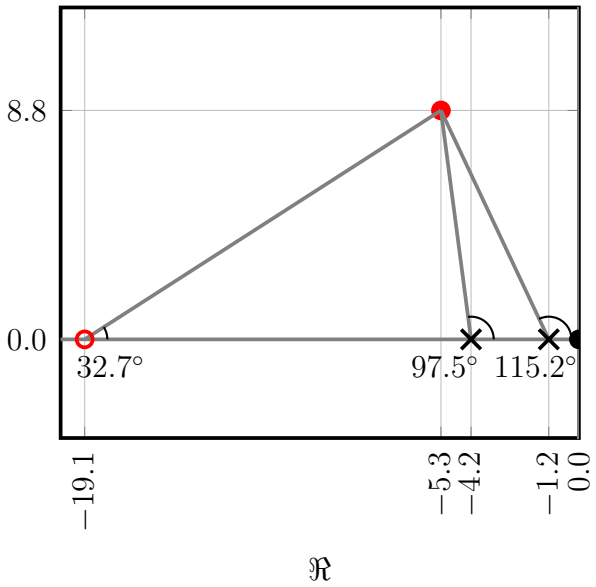


3. (30 points) A design point on the root-locus plot for a P-type controller is shown below.



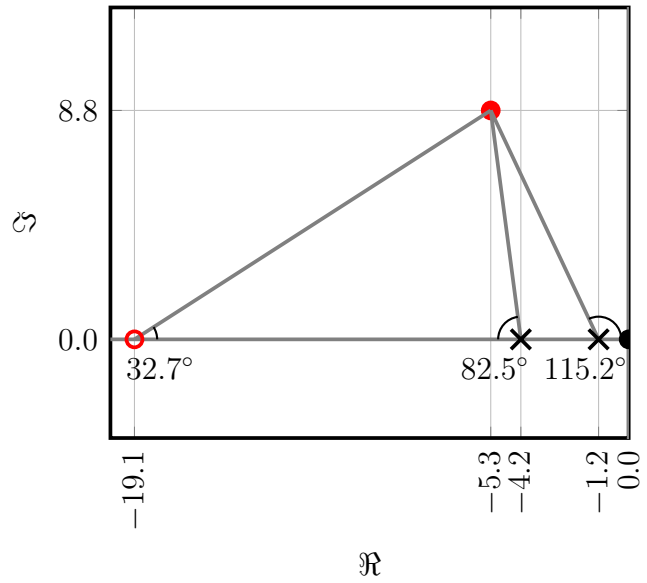
A zero is added so that the root-locus passes through this design point. Which of the following represents the correct angle condition for this design?

A. $\sum \theta = 115.2^\circ + 97.5^\circ - 32.7^\circ = 180.0^\circ$



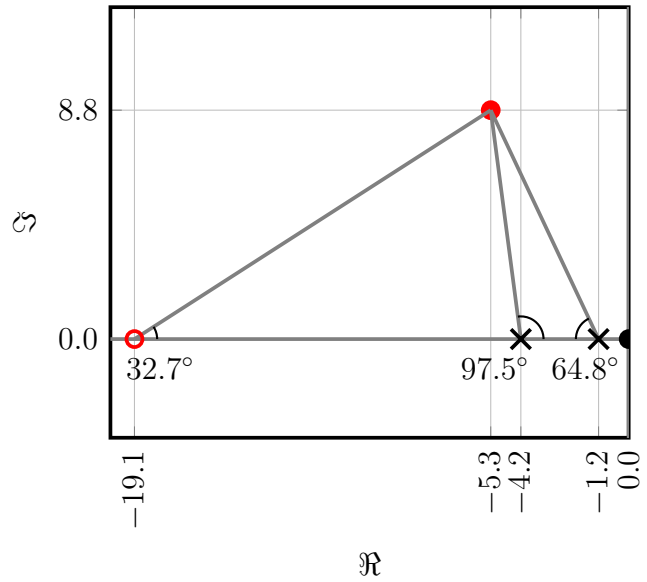
$$\sum \theta = 115.2^\circ + 82.5^\circ + 32.7^\circ = 230.5^\circ$$

B.



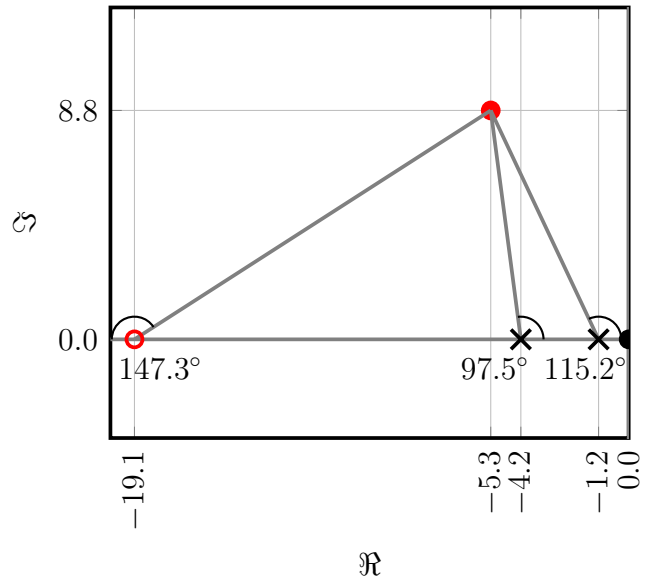
$$\sum \theta = 64.8^\circ + 97.5^\circ + 32.7^\circ = 195.0^\circ$$

C.



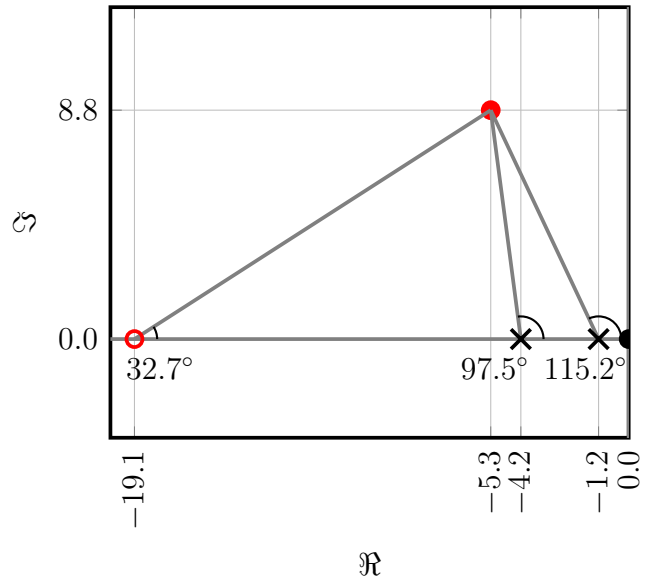
$$\sum \theta = 115.2^\circ + 97.5^\circ + 147.3^\circ = 360.0^\circ$$

D.



$$\sum \theta = 115.2^\circ + 97.5^\circ + 32.7^\circ = 245.4^\circ$$

E.



Q	A
1	D
2	B
3	A