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

$$G(s) = \frac{1}{s^3 + 2.0s^2 + 3.04039s + 7.04039}$$

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

A. $F(s) = 0.6616 + \frac{2.5808}{s}$

B. $F(s) = 0.74242 + \frac{1.0808}{s}$

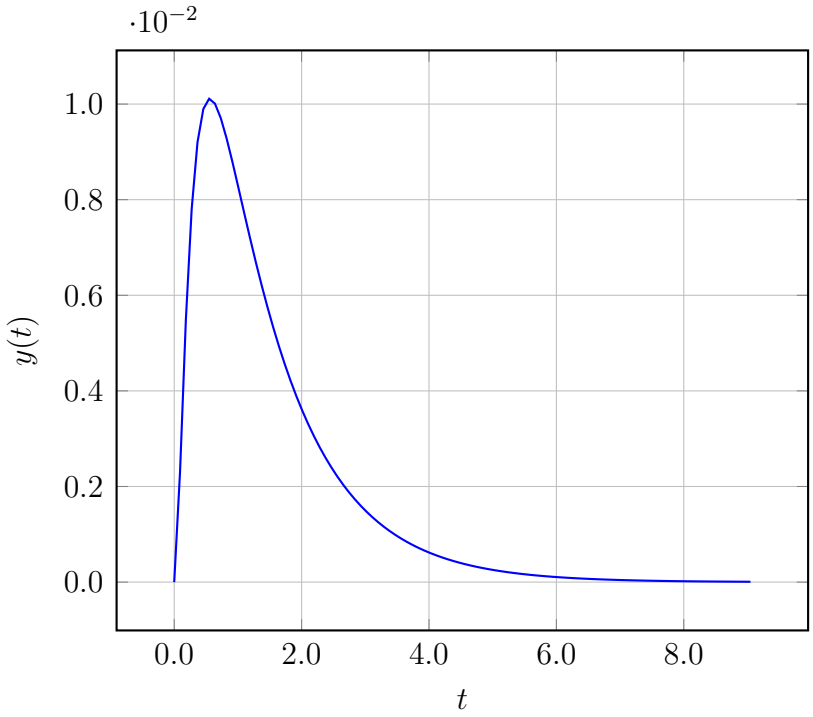
C. $F(s) = -9.75758 + \frac{2.5808}{s}$

D. $F(s) = -9.8384 + \frac{1.0808}{s}$

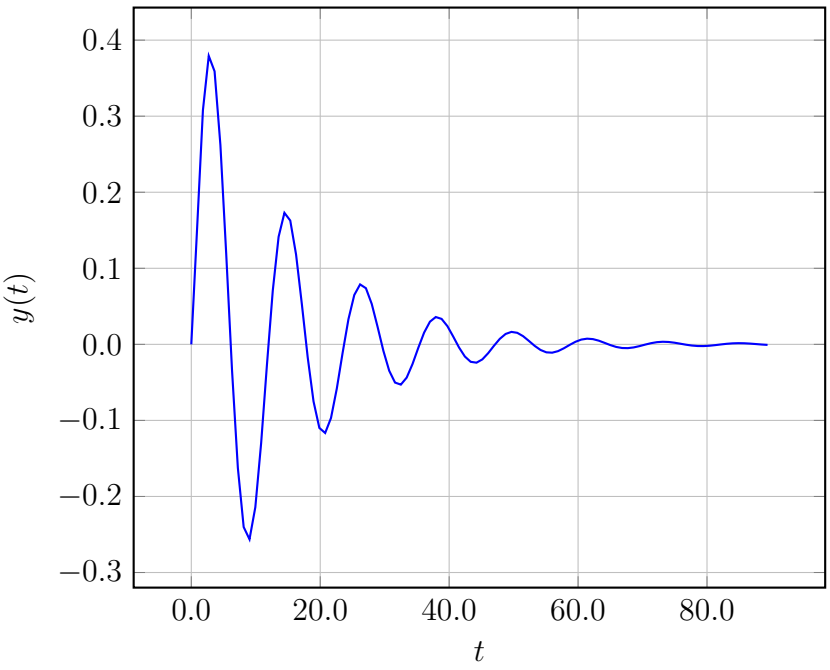
E. $F(s) = -2.5808 + \frac{0.54039}{s}$

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?

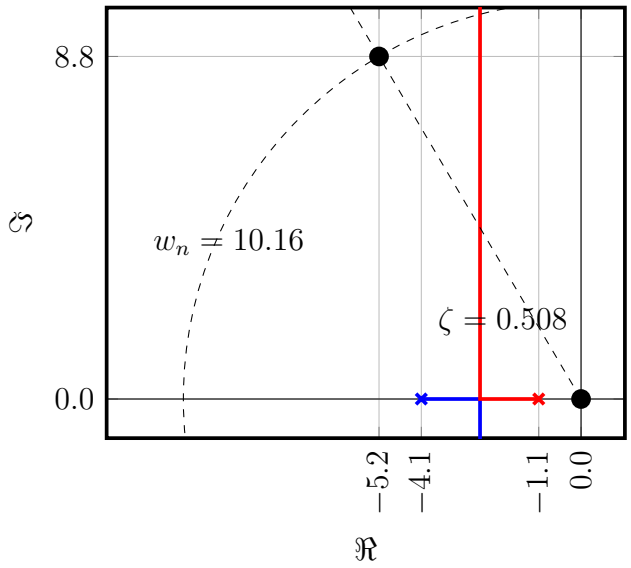
A.



B.



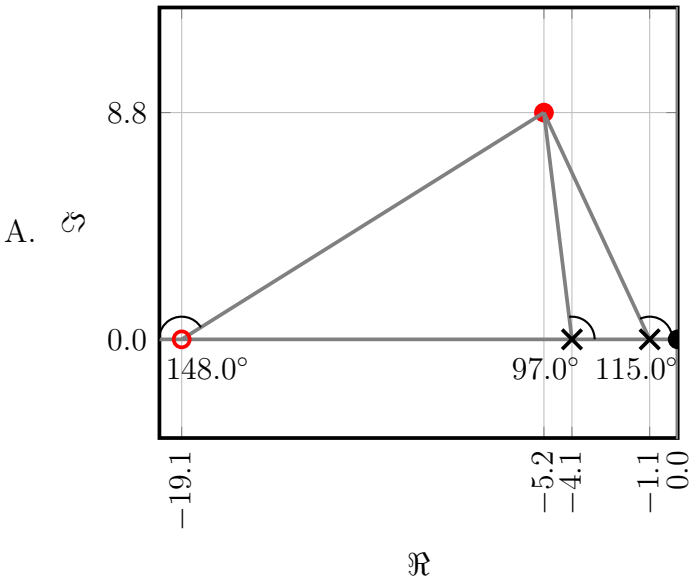
3. (30 points) A design point on the root-locus plot for a P-type controller is shown below.



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?

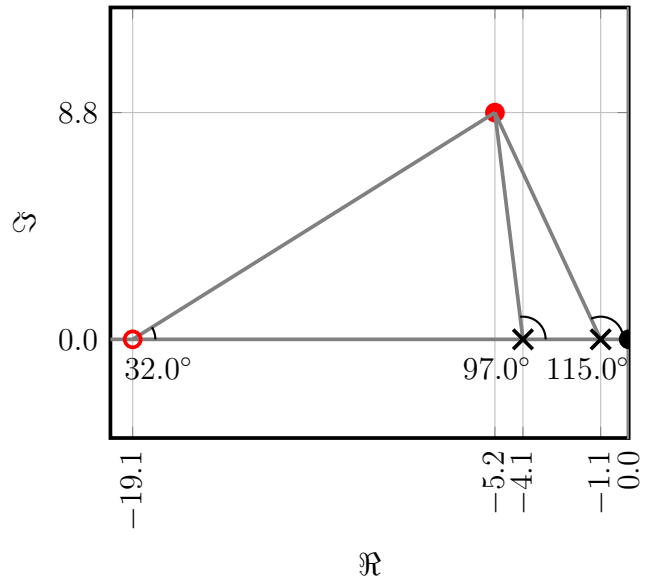
$$\sum \theta = 115.0^\circ + 97.0^\circ + 148.0^\circ = 360.0^\circ$$

A.



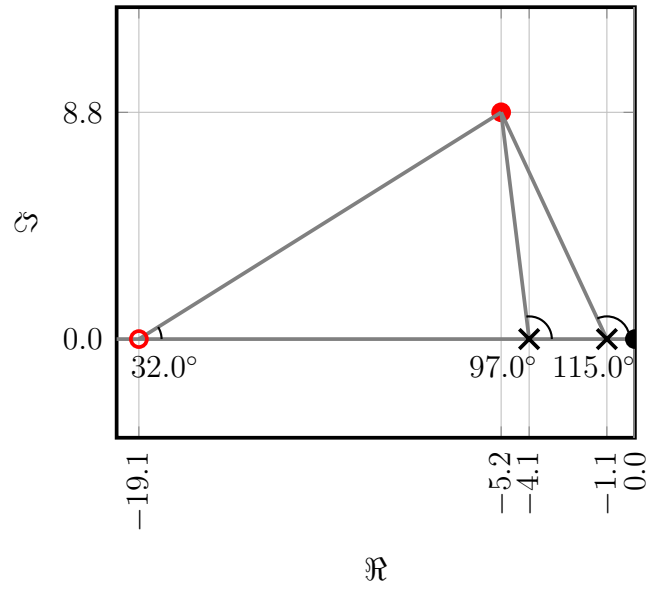
$$\sum \theta = 115.0^\circ + 97.0^\circ + 32.0^\circ = 244.1^\circ$$

B.



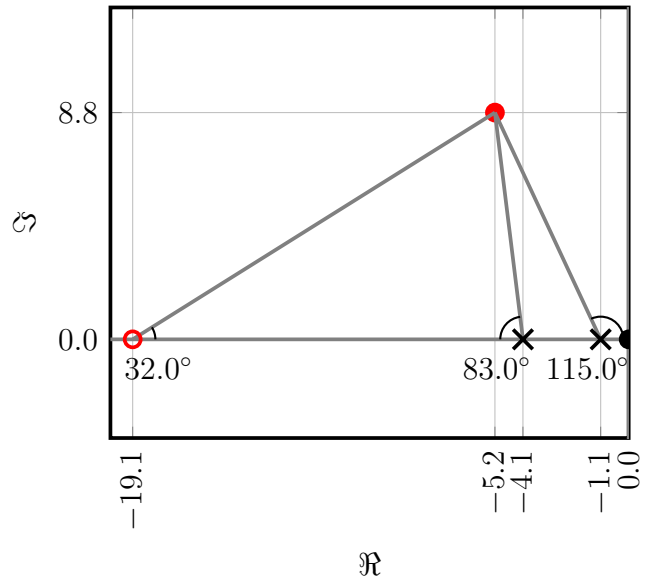
$$\sum \theta = 115.0^\circ + 97.0^\circ - 32.0^\circ = 180.0^\circ$$

C.



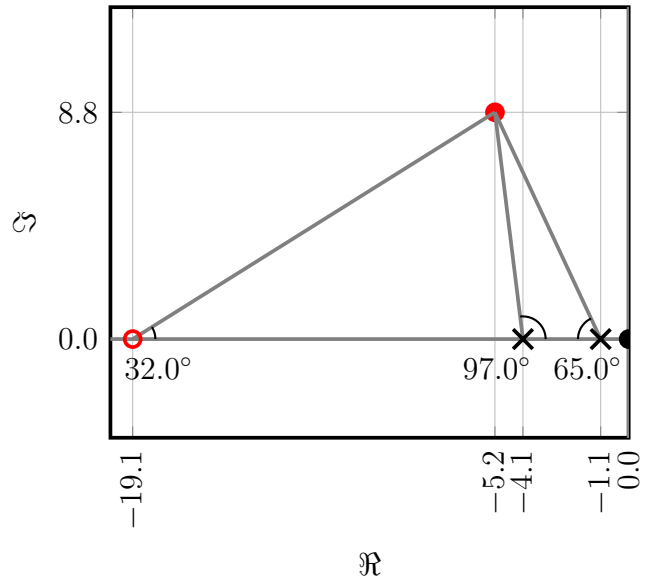
$$\sum \theta = 115.0^\circ + 83.0^\circ + 32.0^\circ = 230.0^\circ$$

D.



$$\sum \theta = 65.0^\circ + 97.0^\circ + 32.0^\circ = 194.1^\circ$$

E.



Q	A
1	E
2	A
3	C