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

$$G(s) = \frac{1}{s^3 + 2.0s^2 + 3.1212s + 7.1212}$$

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

A. $F(s) = -2.74242 + \frac{0.6212}{s}$

B. $F(s) = 0.98485 + \frac{2.74242}{s}$

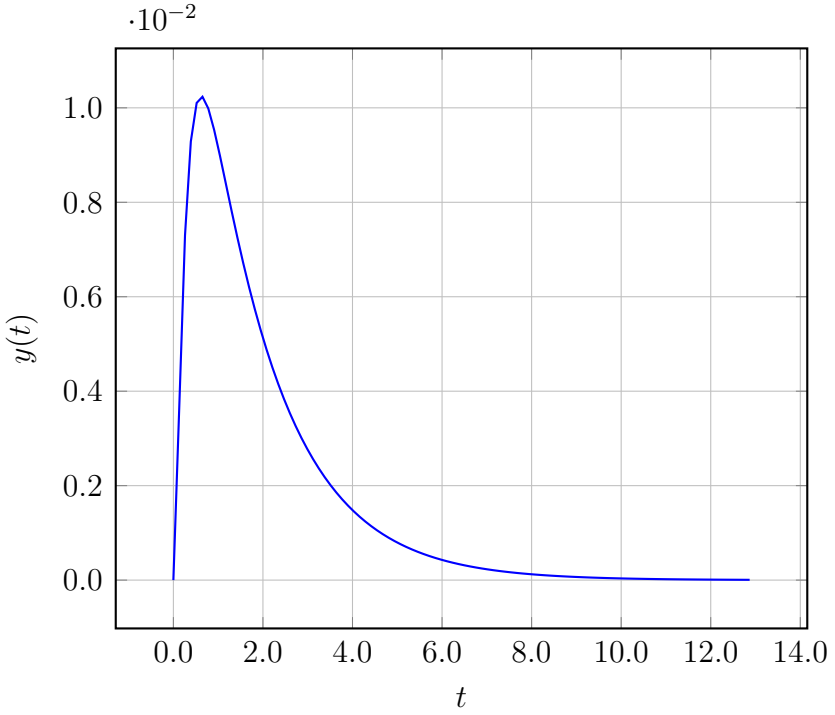
C. $F(s) = -9.27274 + \frac{2.74242}{s}$

D. $F(s) = -9.51515 + \frac{1.24242}{s}$

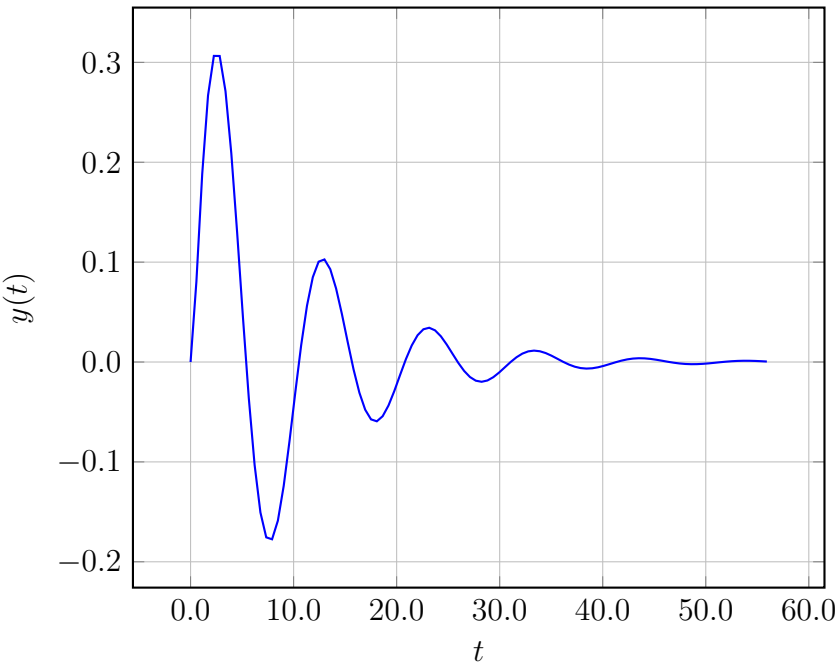
E. $F(s) = 1.22726 + \frac{1.24242}{s}$

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?

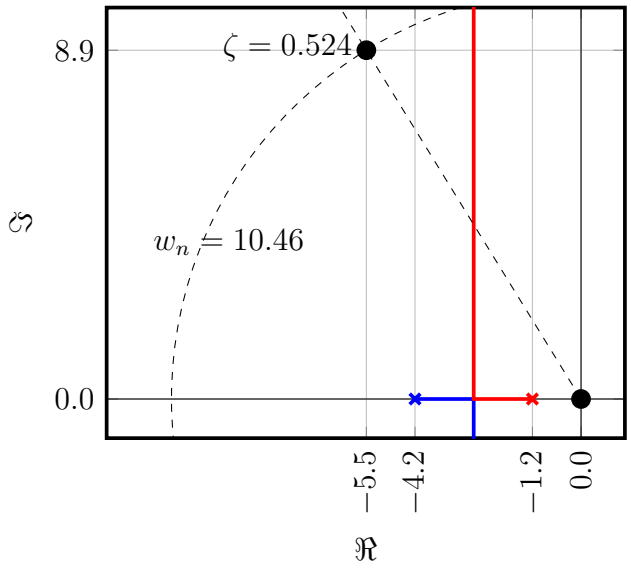
A.



B.



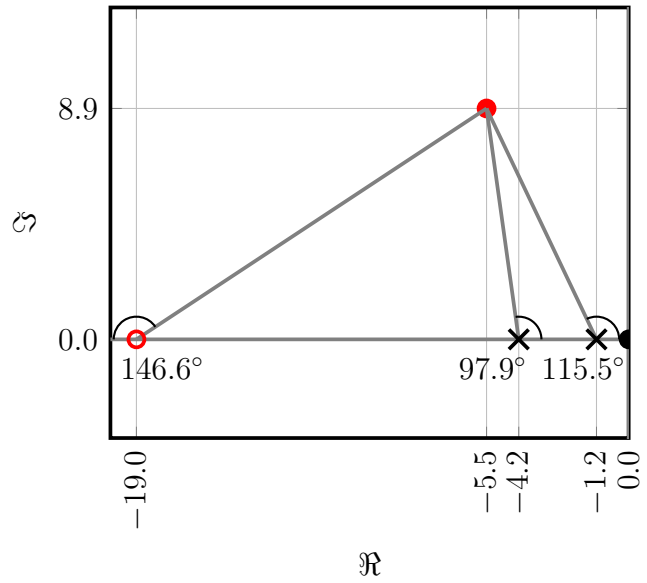
3. (30 points) A design point on the root-locus plot for a P-type controller is shown below.



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?

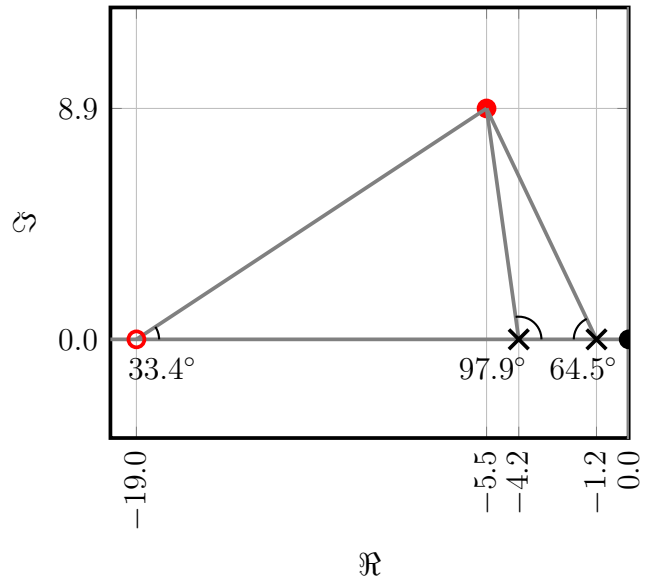
$$\sum \theta = 115.5^\circ + 97.9^\circ + 146.6^\circ = 360.0^\circ$$

A.



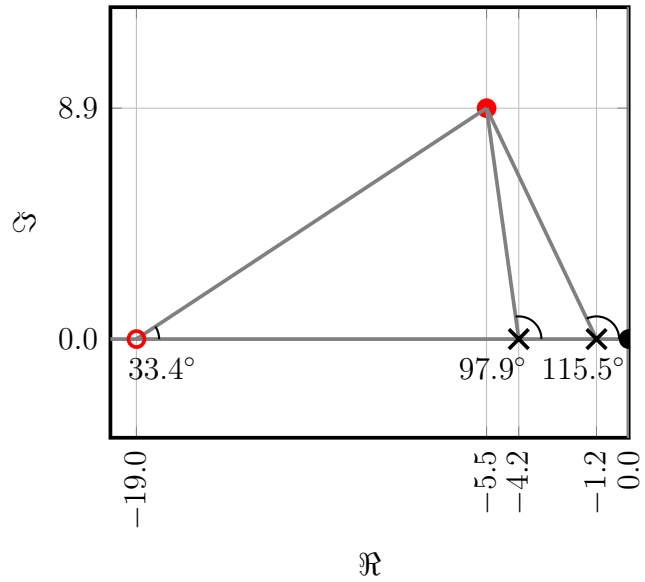
$$\sum \theta = 64.5^\circ + 97.9^\circ + 33.4^\circ = 195.9^\circ$$

B.



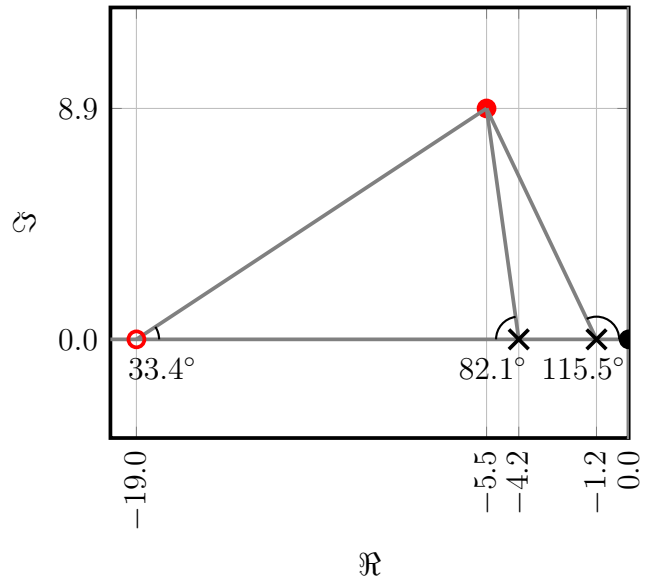
$$\sum \theta = 115.5^\circ + 97.9^\circ + 33.4^\circ = 246.8^\circ$$

C.



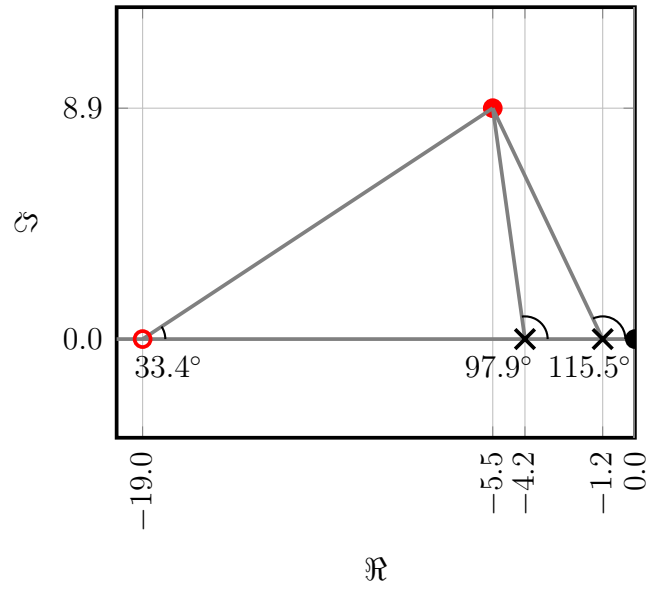
$$\sum \theta = 115.5° + 82.1° + 33.4° = 230.9°$$

D.



$$\sum \theta = 115.5° + 97.9° - 33.4° = 180.0°$$

E.



Q	A
1	A
2	A
3	E