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

$$G(s) = \frac{1}{s^3 + 2.0s^2 + 3.24747s + 7.24747}$$

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

A. $F(s) = -2.99495 + \frac{0.74747}{s}$

B. $F(s) = 1.98485 + \frac{1.49495}{s}$

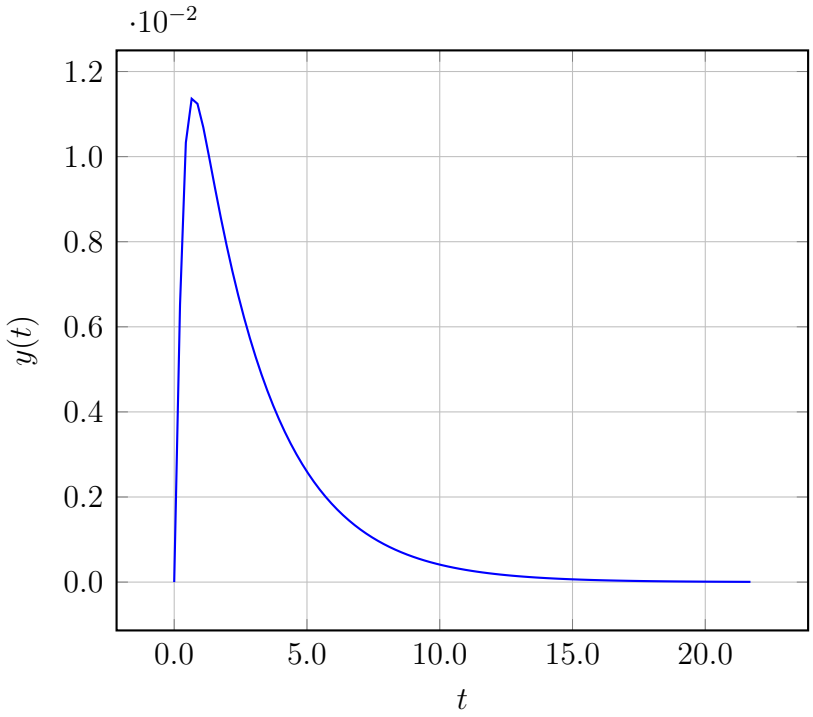
C. $F(s) = -9.0101 + \frac{1.49495}{s}$

D. $F(s) = -8.51515 + \frac{2.99495}{s}$

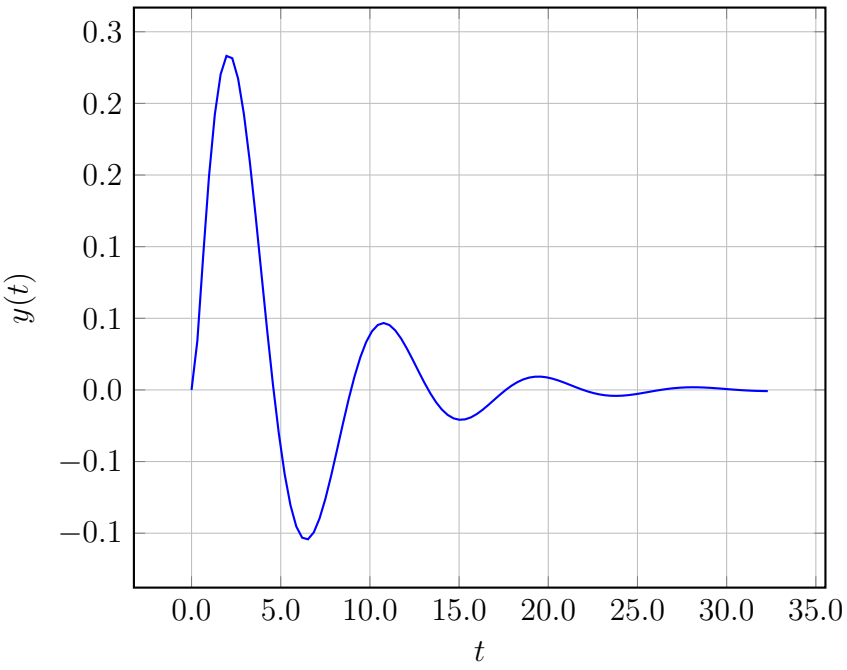
E. $F(s) = 1.4899 + \frac{2.99495}{s}$

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?

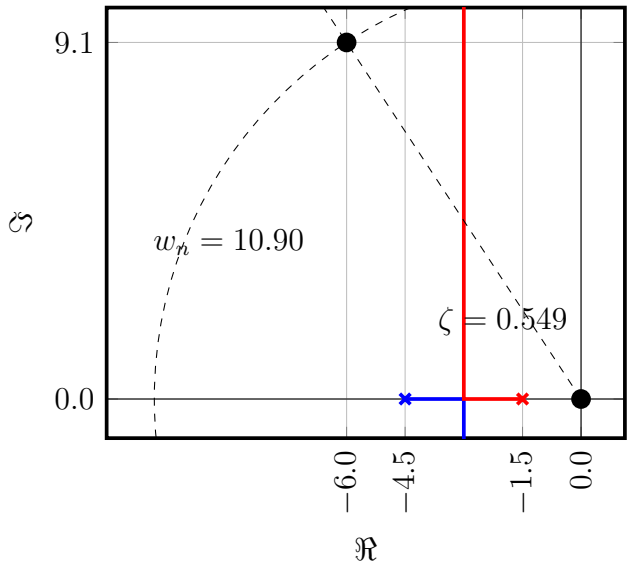
A.



B.



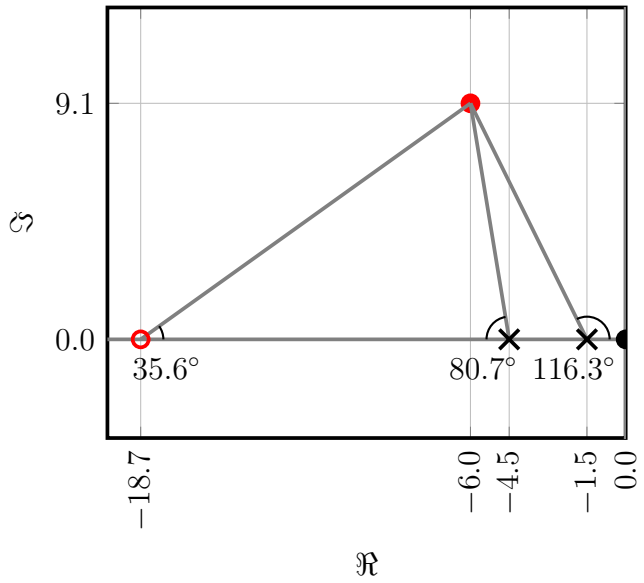
3. (30 points) A design point on the root-locus plot for a P-type controller is shown below.



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?

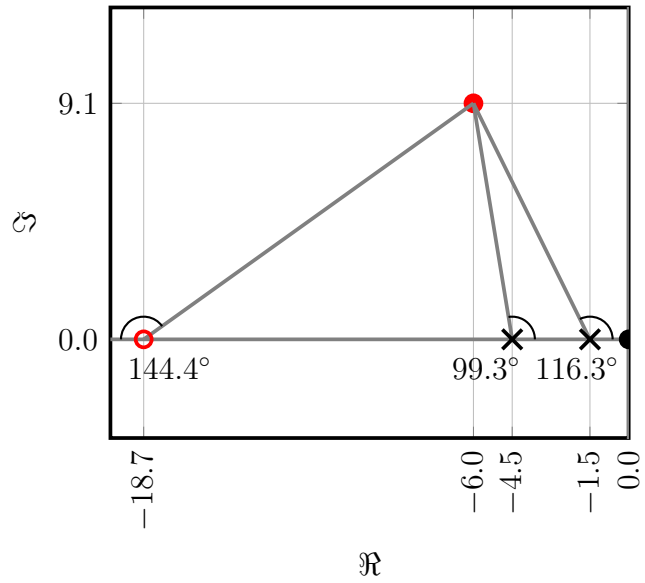
$$\sum \theta = 116.3^\circ + 80.7^\circ + 35.6^\circ = 232.5^\circ$$

A.



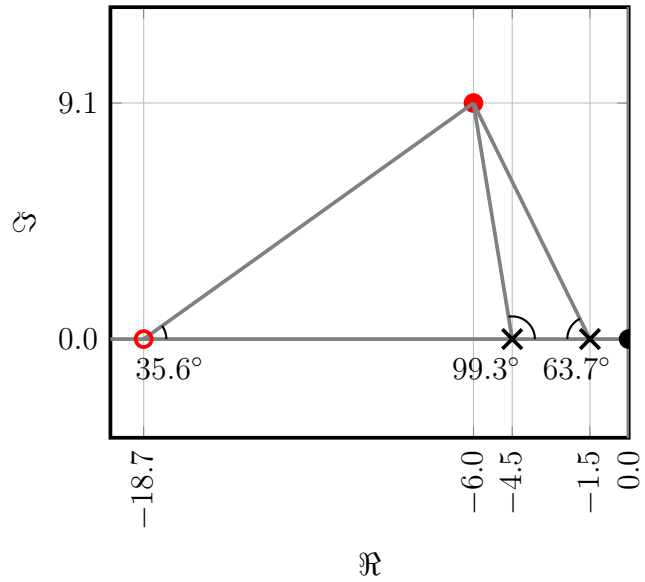
$$\sum \theta = 116.3^\circ + 99.3^\circ + 144.4^\circ = 360.0^\circ$$

B.



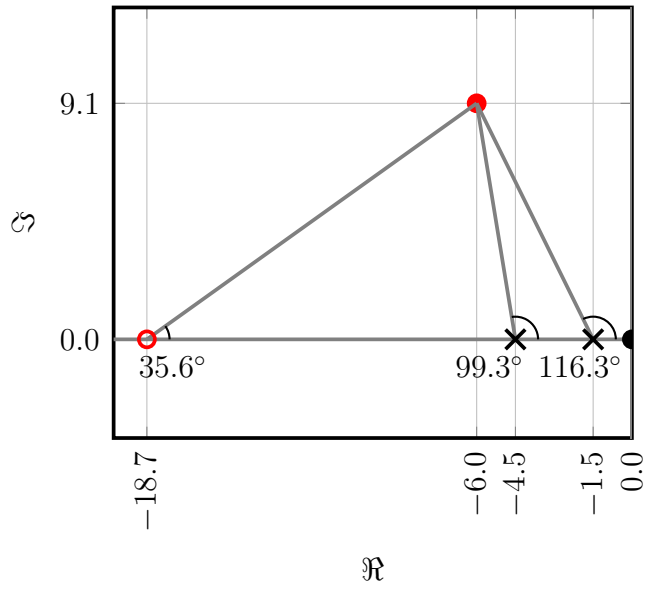
$$\sum \theta = 63.7^\circ + 99.3^\circ + 35.6^\circ = 198.6^\circ$$

C.



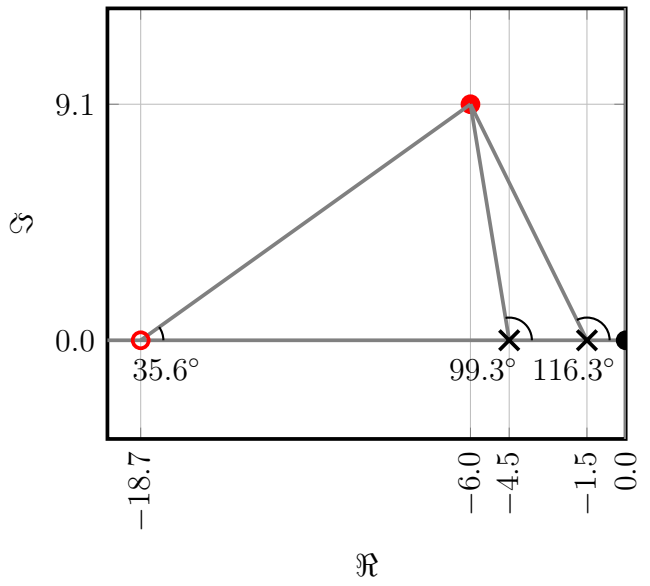
$$\sum \theta = 116.3° + 99.3° - 35.6° = 180.0°$$

D.



$$\sum \theta = 116.3° + 99.3° + 35.6° = 251.2°$$

E.



Q	A
1	A
2	A
3	D