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

$$G(s) = \frac{1}{s^3 + 2.0s^2 + 3.38383s + 7.38383}$$

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

A. $F(s) = -8.46466 + \frac{1.76767}{s}$

B. $F(s) = -3.26767 + \frac{0.88383}{s}$

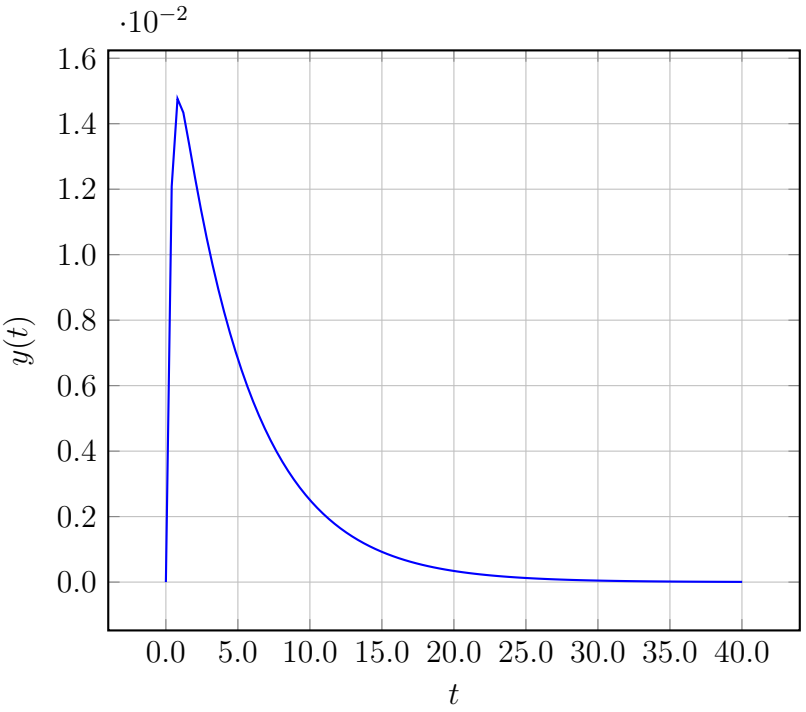
C. $F(s) = -7.69698 + \frac{3.26767}{s}$

D. $F(s) = 2.80302 + \frac{1.76767}{s}$

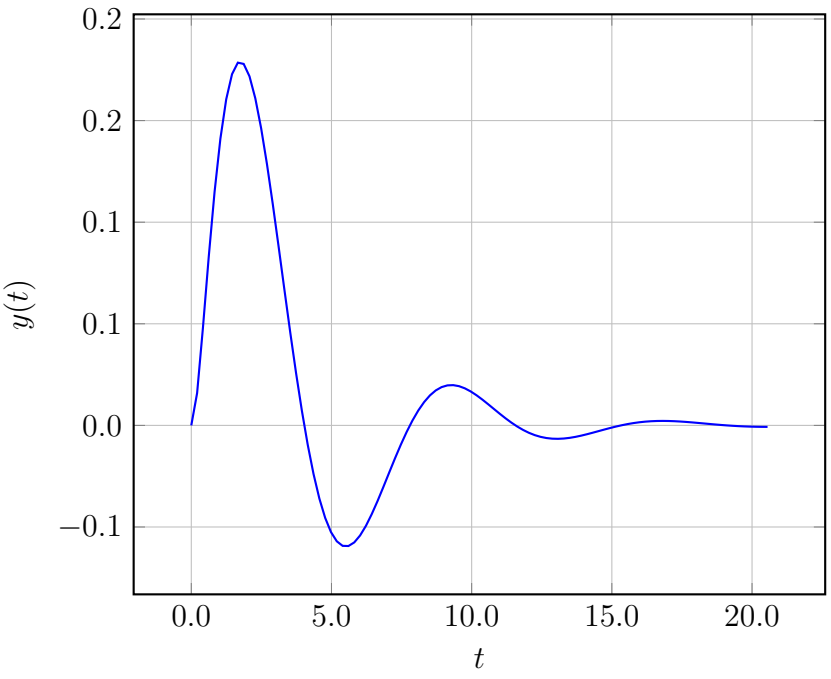
E. $F(s) = 2.03534 + \frac{3.26767}{s}$

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?

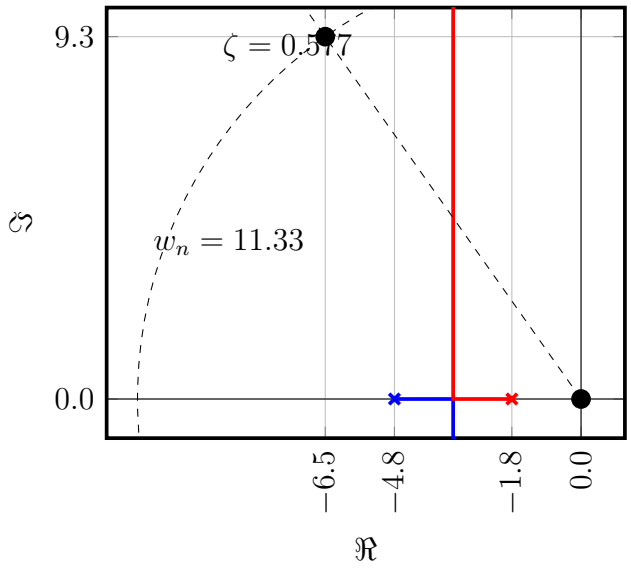
A.



B.



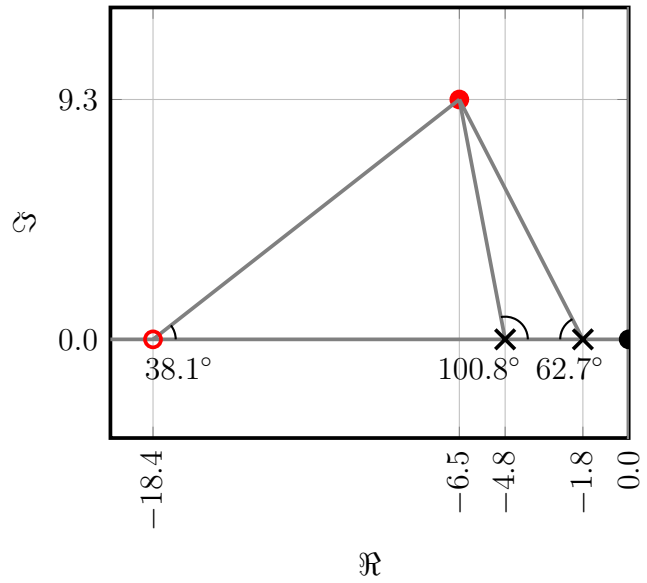
3. (30 points) A design point on the root-locus plot for a P-type controller is shown below.



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?

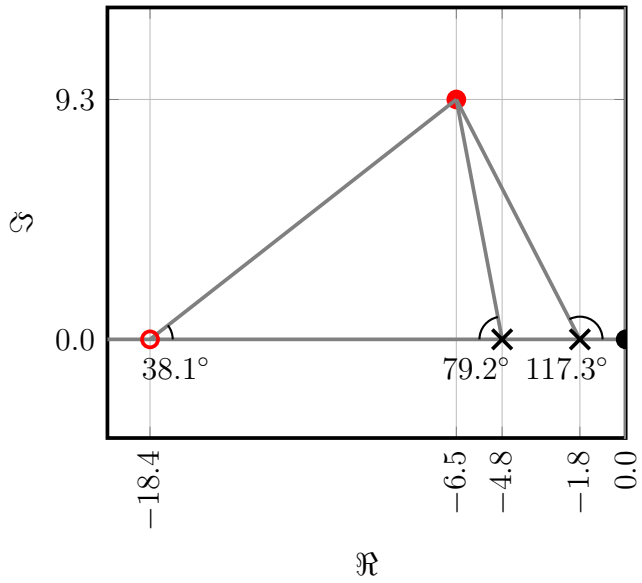
$$\sum \theta = 62.7^\circ + 100.8^\circ + 38.1^\circ =$$

A.



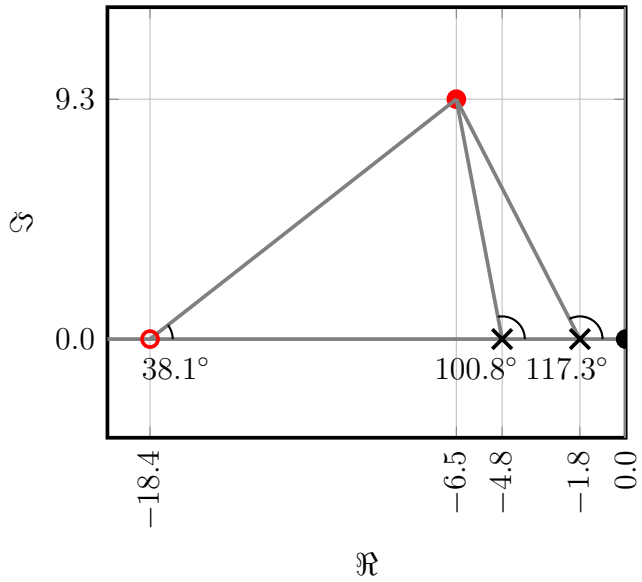
$$\sum \theta = 117.3° + 79.2° + 38.1° =$$

B.



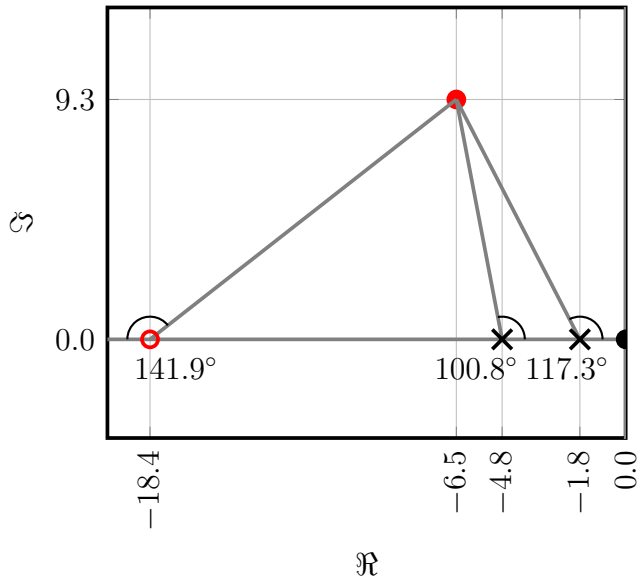
$$\sum \theta = 117.3° + 100.8° - 38.1° =$$

C.



$$\sum \theta = 117.3^\circ + 100.8^\circ + 141.9^\circ =$$

D.



$$\sum \theta = 117.3^\circ + 100.8^\circ + 38.1^\circ =$$

E.