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

$$G(s) = \frac{1}{s^3 + 2.0s^2 + 3.00504s + 7.00504}$$

which of the following PI-controllers stabilizes the system in a closed-loop unit feedback structure?

A. $F(s) = -9.97981 + \frac{1.01009}{s}$

B. $F(s) = -2.51009 + \frac{0.50504}{s}$

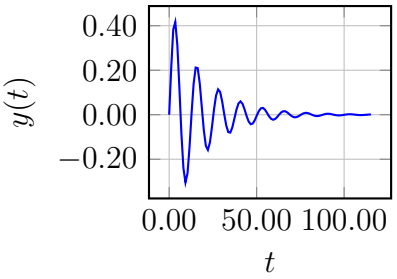
C. $F(s) = 0.53029 + \frac{1.01009}{s}$

D. $F(s) = -9.96971 + \frac{2.51009}{s}$

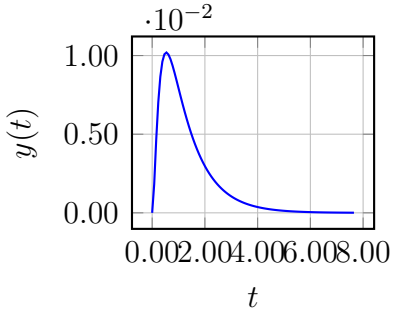
E. $F(s) = 0.52019 + \frac{2.51009}{s}$

2. (35 points) Which of the following does not overshoot?

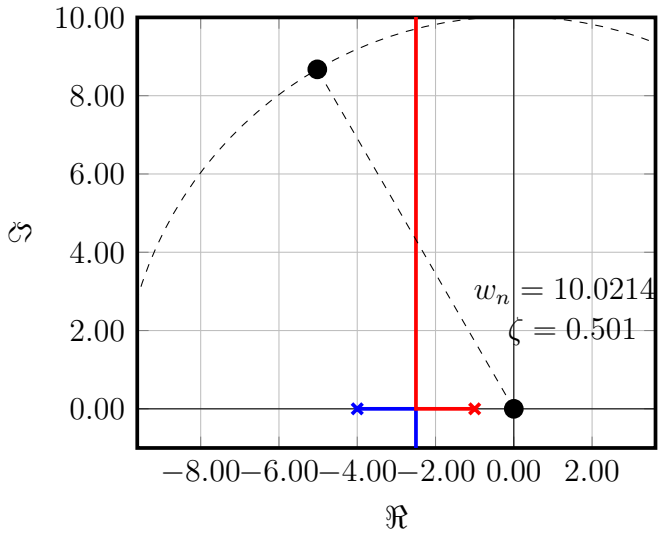
A.



B.

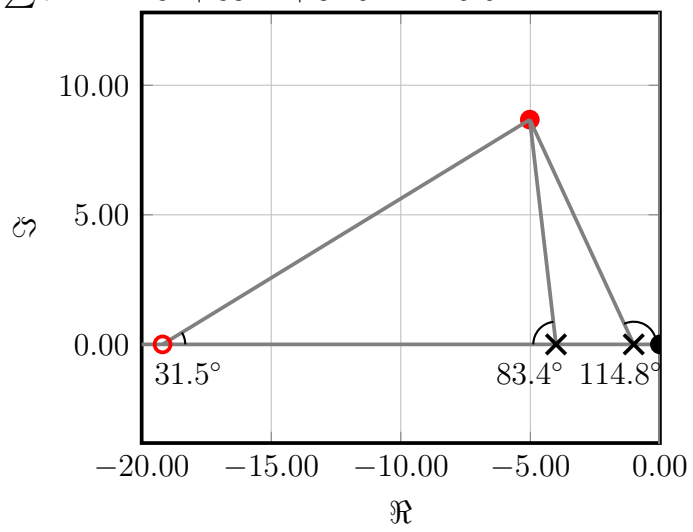


3. (30 points) Time-domain criteria is give as settling time $t_s = 1\,s$ and overshoot $os = 10\%$. The root-locus plot for the P-type controller design is depicted below.

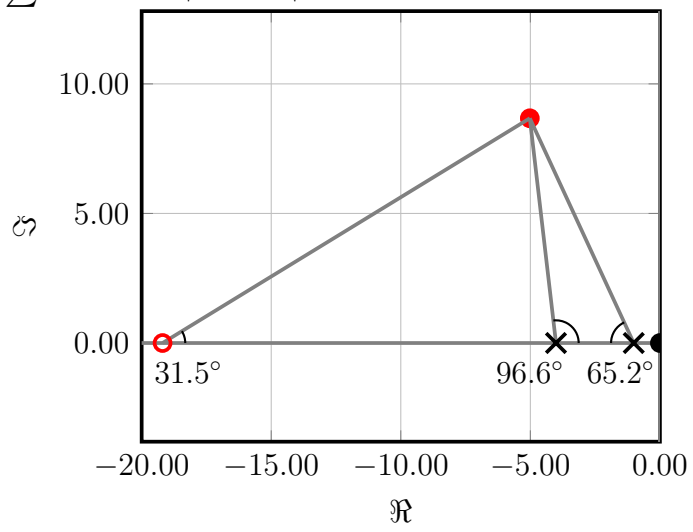


Upgrading the controller to a PD-type controller which of the following angle conditions need to be used?

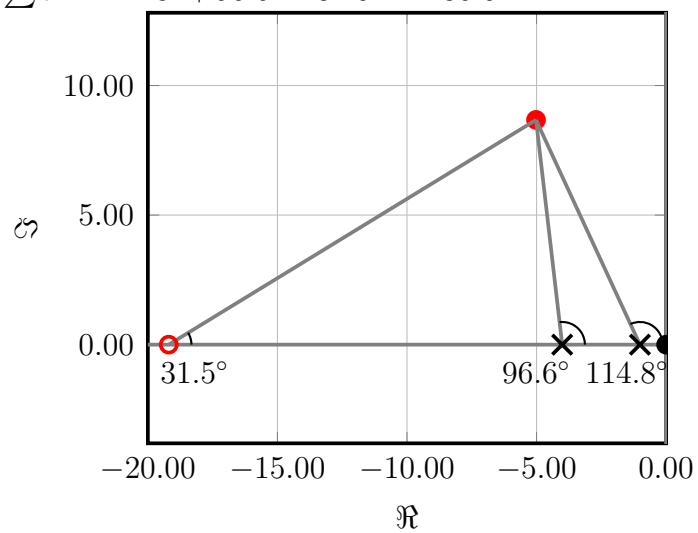
A. $\sum \theta = 114.8° + 83.4° + 31.5° = 229.6°$



B. $\sum \theta = 65.2° + 96.6° + 31.5° = 193.3°$

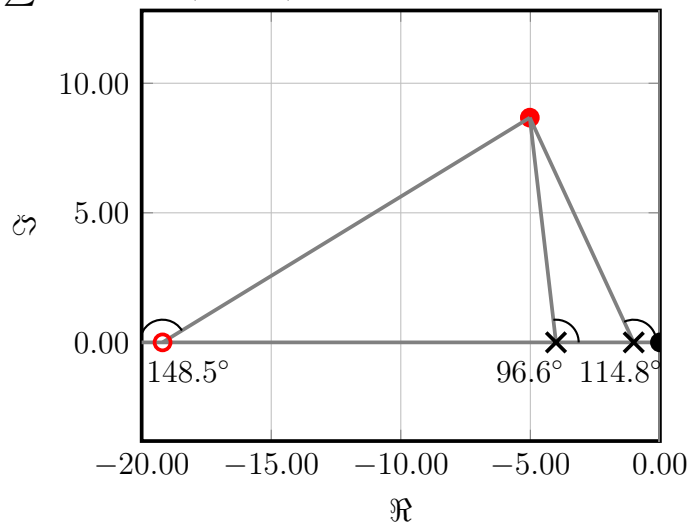


C. $\sum \theta = 114.8° + 96.6° - 31.5° = 180.0°$



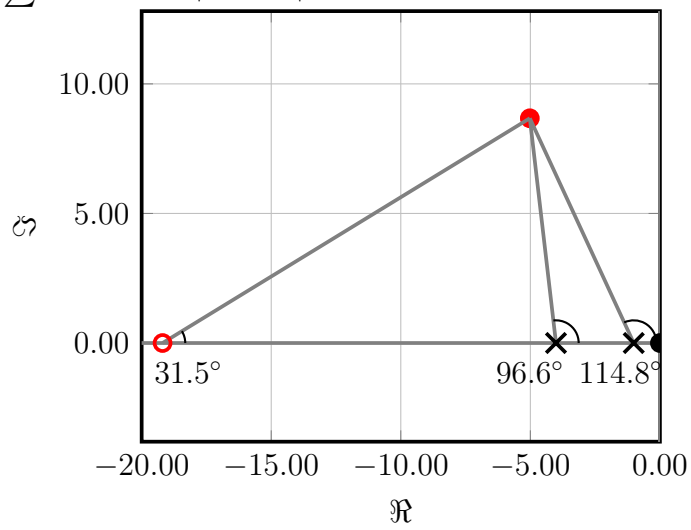
D.

$\sum \theta = 114.8° + 96.6° + 148.5° = 360.0°$



E.

$\sum \theta = 114.8° + 96.6° + 31.5° = 242.9°$



Q	A
1	B
2	B
3	C