

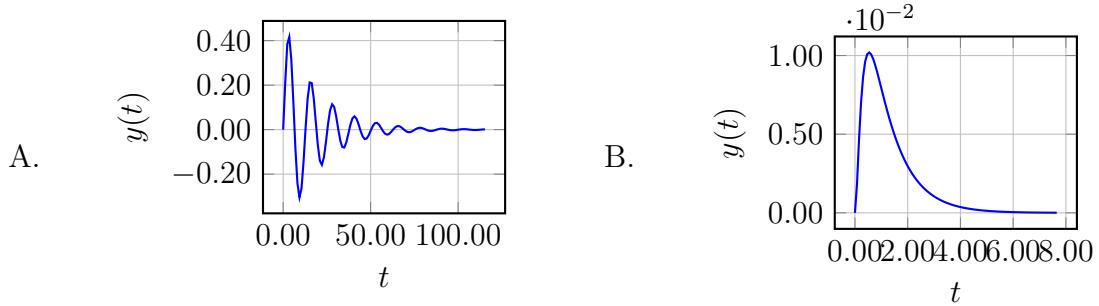
1. (35 points) An open-loop transfer function is given as,

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

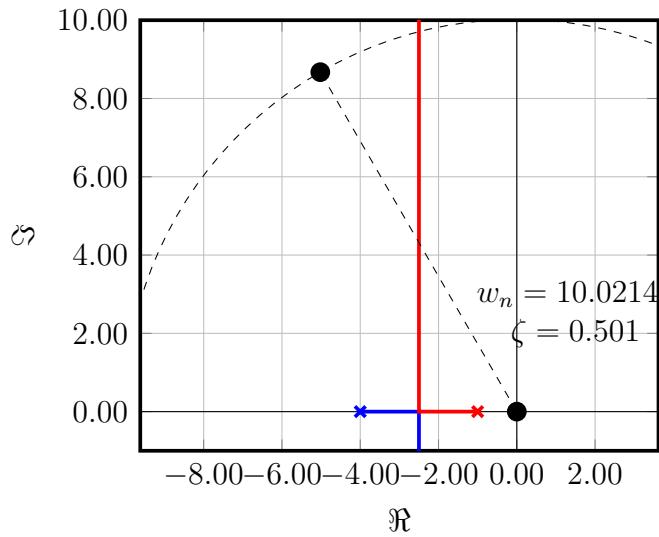
which of the following PI-controllers stabilizes the system in a closed-loop unit feedback structure?

- 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?

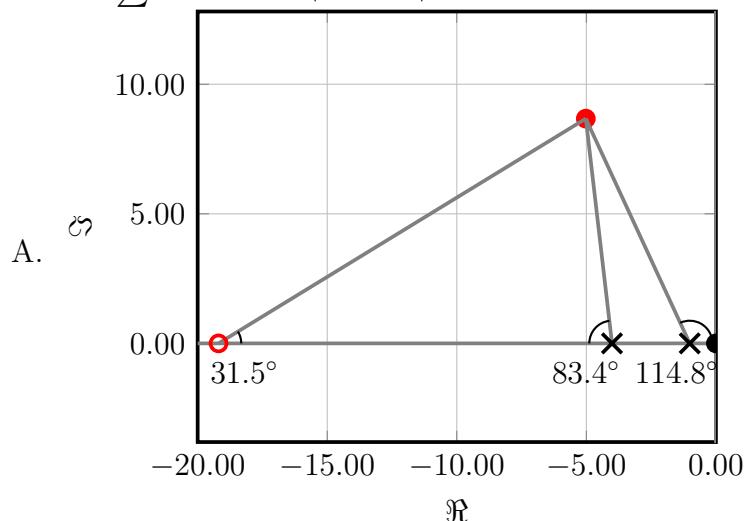


3. (30 points) Time-domain criteria is give as settling time $t_s = 1 s$ and overshoot $os = 10\%$. The root-locus plot for the P-type controller design is depicted below.

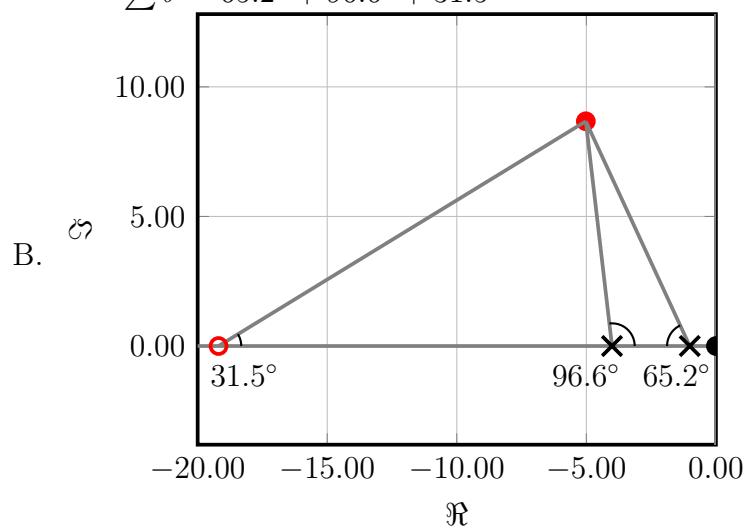


Upgrading the controller to a PD-type controller which of the following angle conditions need to be used?

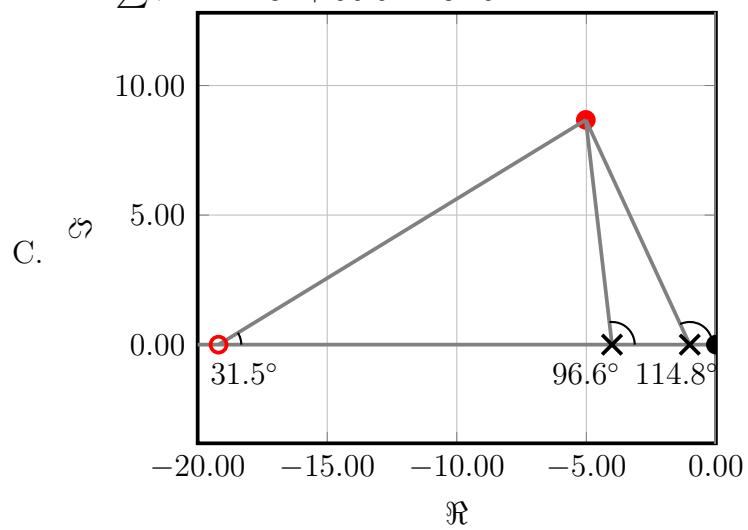
$$\sum \theta = 114.8^\circ + 83.4^\circ + 31.5^\circ$$



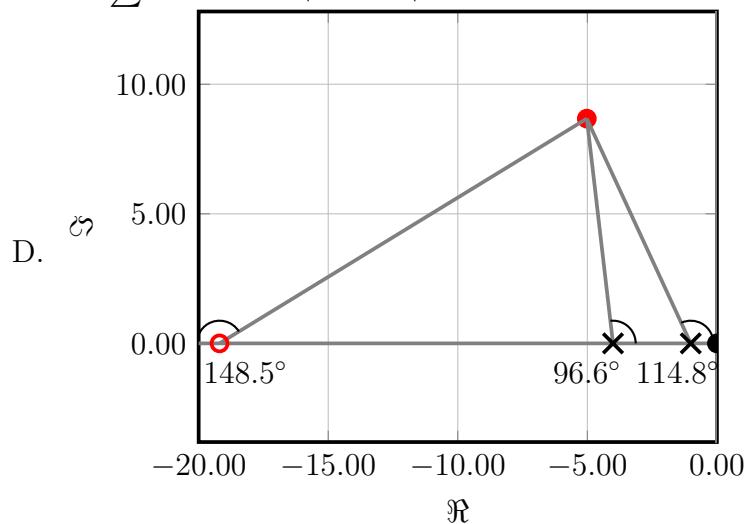
$$\sum \theta = 65.2^\circ + 96.6^\circ + 31.5^\circ$$



$$\sum \theta = 114.8^\circ + 96.6^\circ - 31.5^\circ$$



$$\sum \theta = 114.8^\circ + 96.6^\circ + 148.5^\circ$$



$$\sum \theta = 114.8^\circ + 96.6^\circ + 31.5^\circ$$

