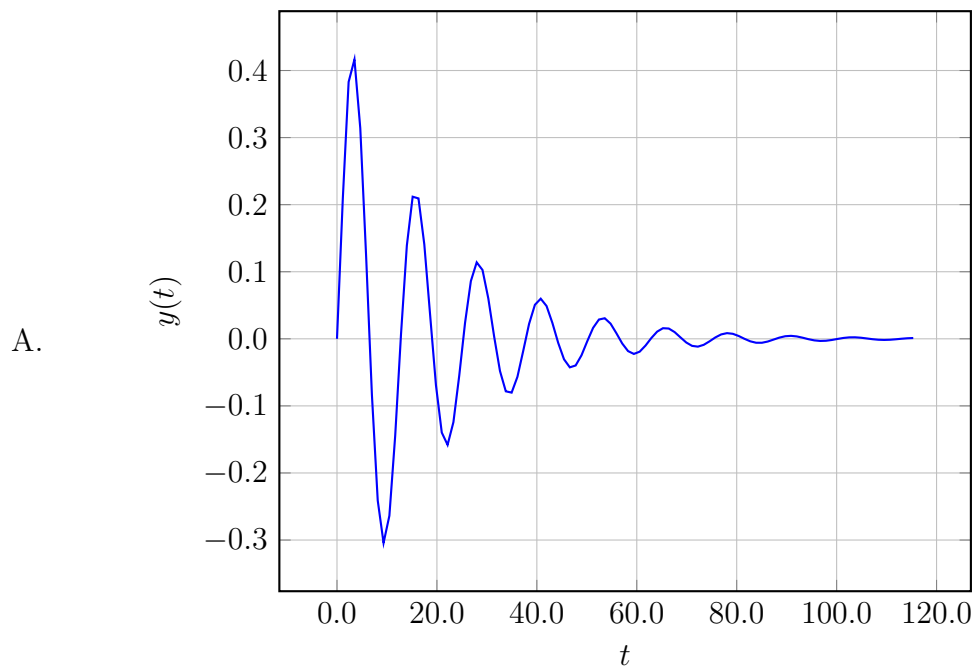1. (35 points) An open-loop transfer function is given by,
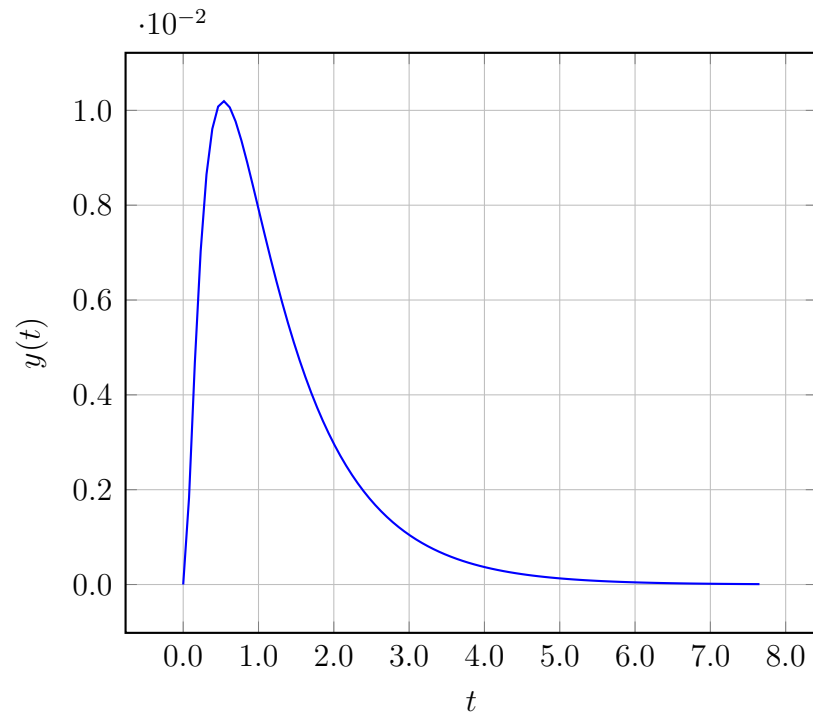
$$G(s) = \frac{1}{s^3 + 2.0s^2 + 3.00504s + 7.00504}$$

Which of the following PI controllers stabilizes the system in a unit-feedback closed-loop configuration?
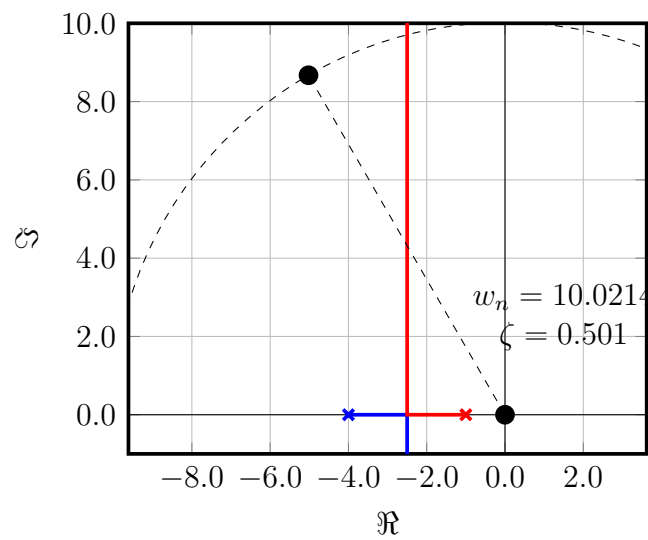
    A. $F(s) = -9.97981 + \frac{1.01009}{s}$

    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 one of the following unit impulse responses corresponds to a system that does not overshoot when subjected to a unit step input?
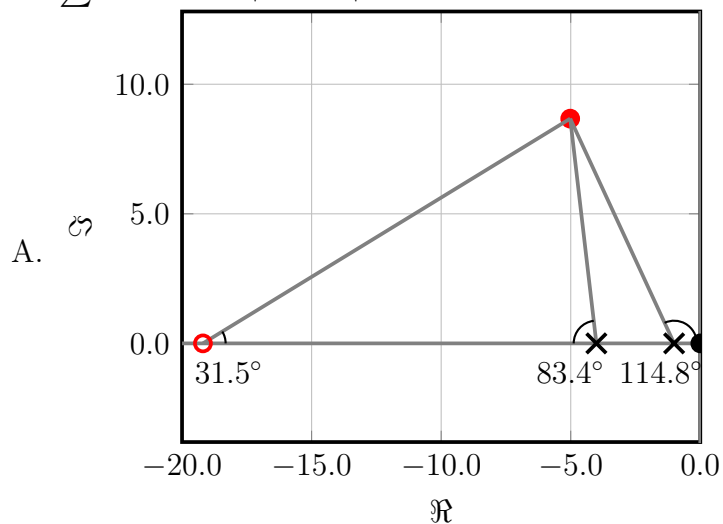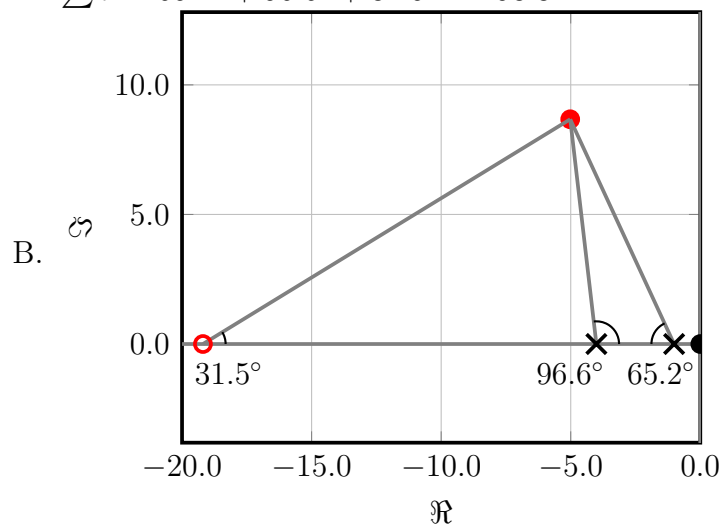
A.

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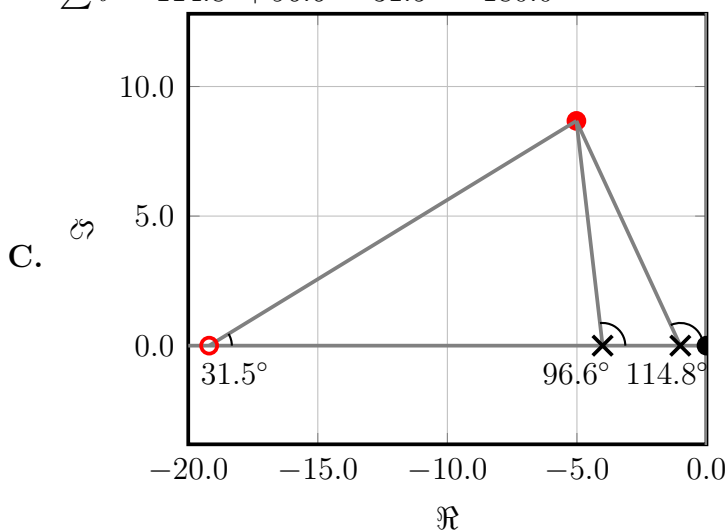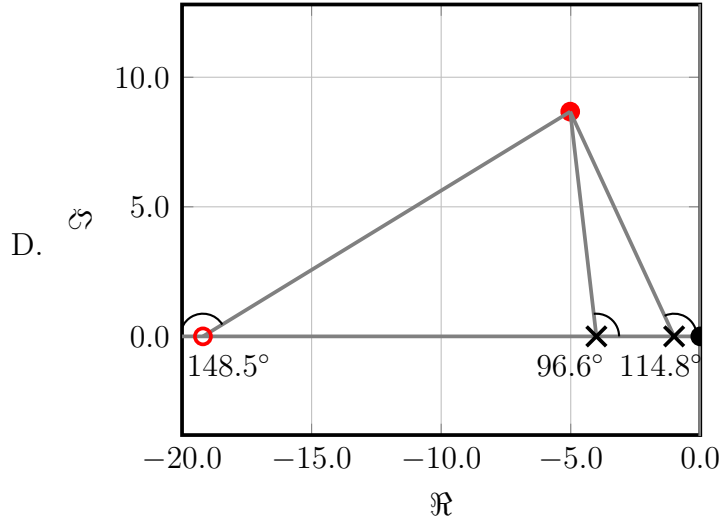
A. $\sum \theta = 114.8° + 83.4° + 31.5° = 229.6°$

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

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

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

D.

148.5°   96.6°   114.8°

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

E.

31.5°   96.6°   114.8°

Q	A
1	B
2	B
3	C