1. (35 points) An open-loop transfer function is given by,
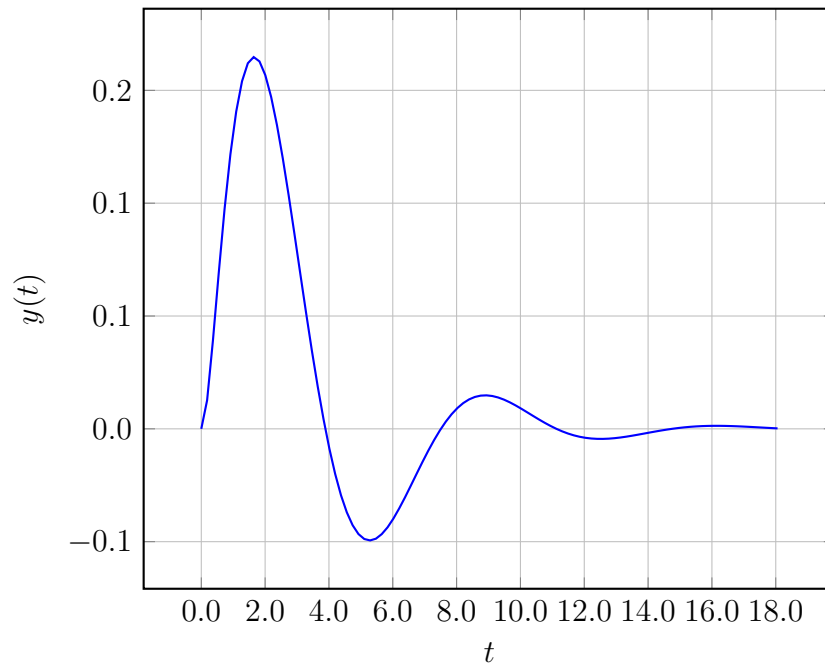
$$G(s) = \frac{1}{s^3 + 2.0s^2 + 3.42929s + 7.42929}$$

Which of the following PI controllers stabilizes the system in a unit-feedback closed-loop configuration?
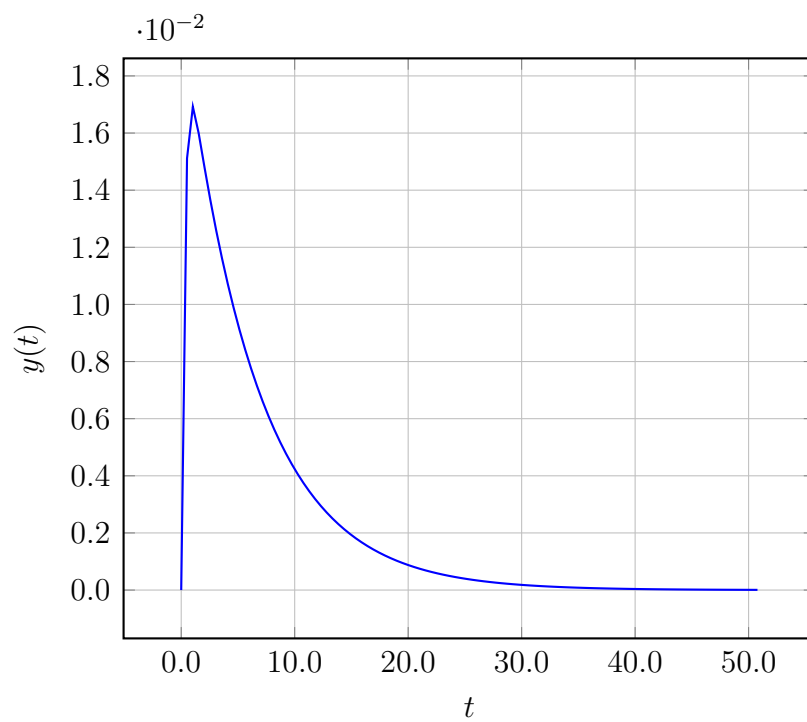
    A. $F(s) = 3.07574 + \frac{1.85858}{s}$

    B. $F(s) = -8.28284 + \frac{1.85858}{s}$

    C. $F(s) = -3.35858 + \frac{0.92929}{s}$

    D. $F(s) = 2.21716 + \frac{3.35858}{s}$

    E. $F(s) = -7.42426 + \frac{3.35858}{s}$

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?
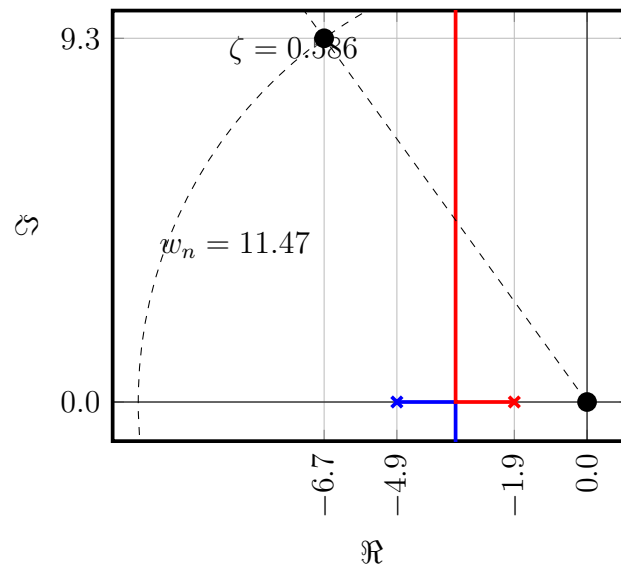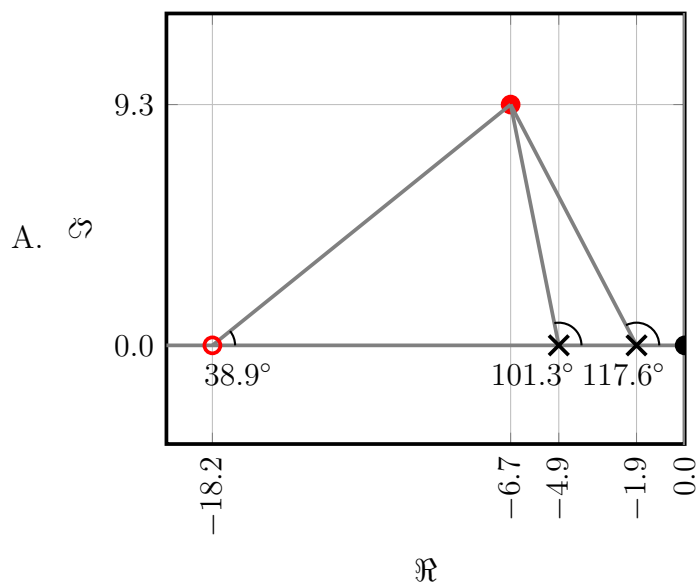
A.

B.

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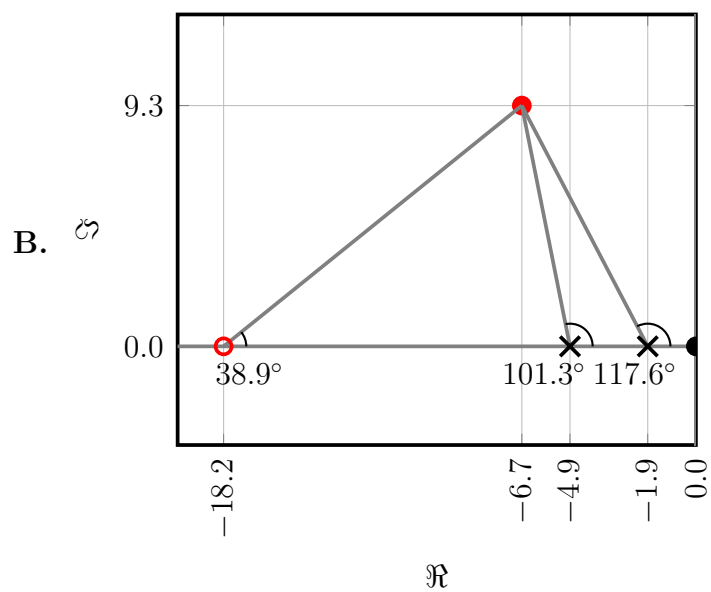

A zero is added so that the root-locus passes through this design point. Which of the following represents the correct angle condition for this design?
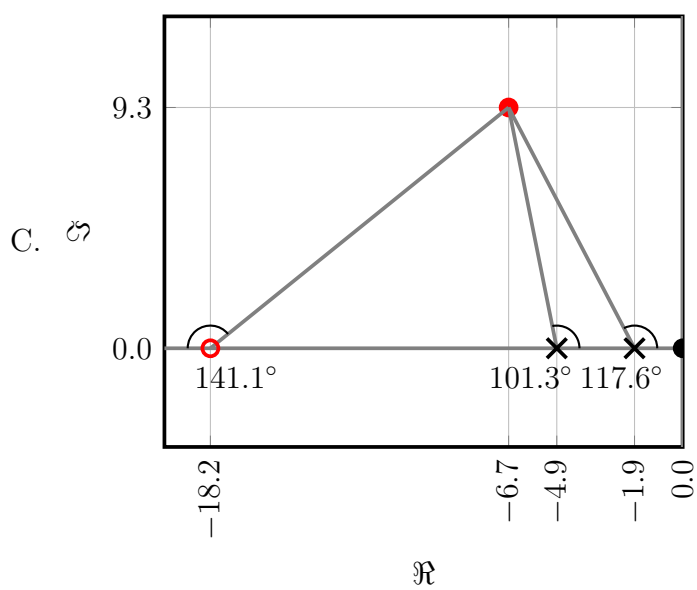
$$\sum \theta = 117.6° + 101.3° + 38.9° = 257.8°$$

A.

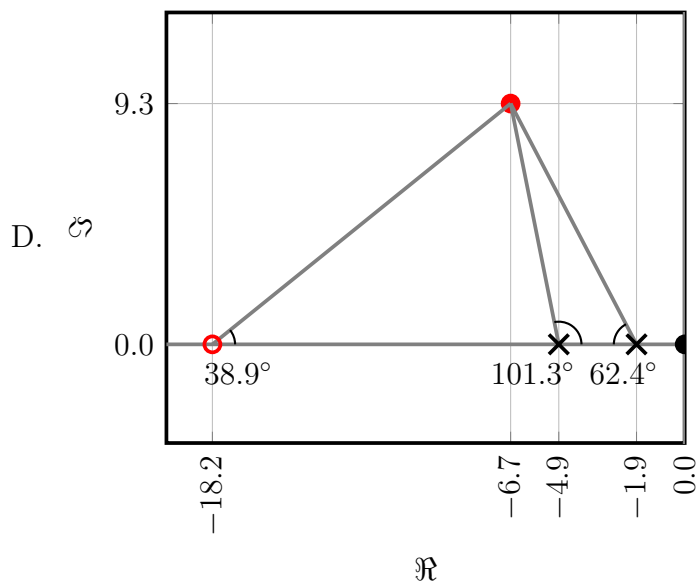$$\sum \theta = 117.6° + 101.3° - 38.9° = 180.0°$$

B.

$$\sum \theta = 117.6° + 101.3° + 141.1° = 360.0°$$

C.

$$\sum \theta = 62.4° + 101.3° + 38.9° = 202.6°$$

D.

$$\sum \theta = 117.6° + 78.7° + 38.9° = 235.2°$$

E.

Q	A
1	C
2	B
3	B