1. (35 points) An open-loop transfer function is given by,
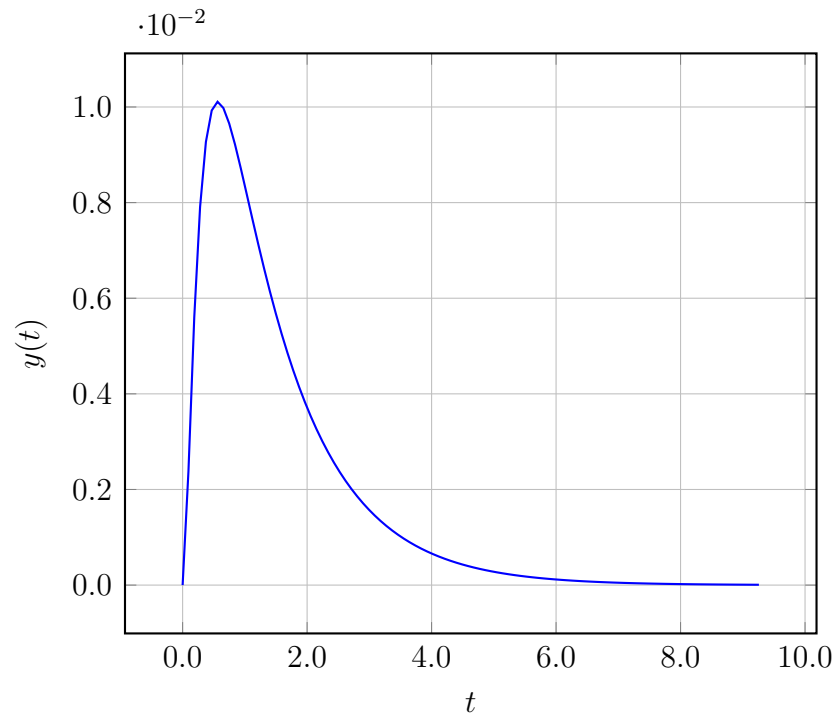
$$G(s) = \frac{1}{s^3 + 2.0s^2 + 3.04544s + 7.04544}$$

Which of the following PI controllers stabilizes the system in a unit-feedback closed-loop configuration?
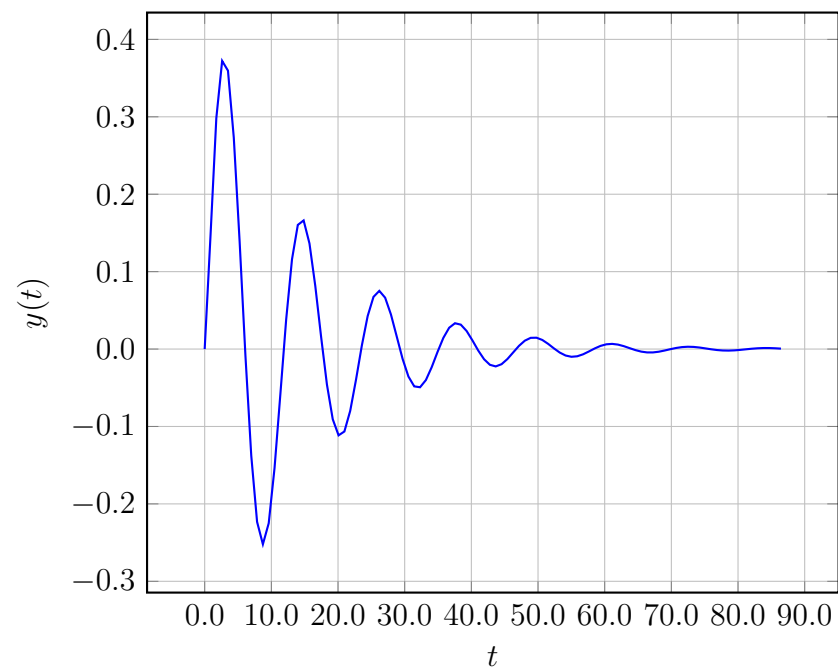
    A. $F(s) = -2.5909 + \frac{0.54544}{s}$

    B. $F(s) = -9.72728 + \frac{2.5909}{s}$

    C. $F(s) = 0.77272 + \frac{1.0909}{s}$

    D. $F(s) = -9.81819 + \frac{1.0909}{s}$

    E. $F(s) = 0.68181 + \frac{2.5909}{s}$

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?
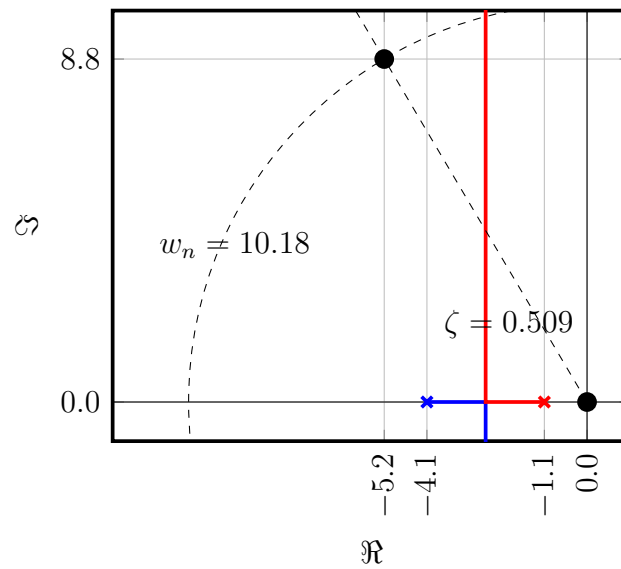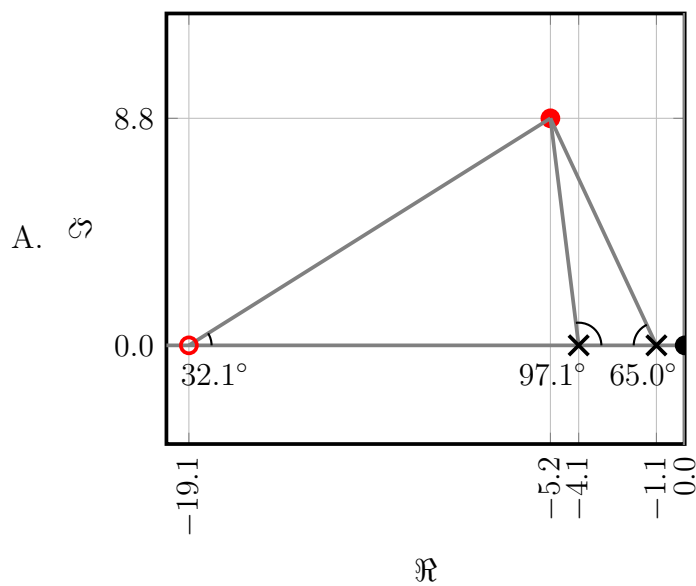
A.

B.

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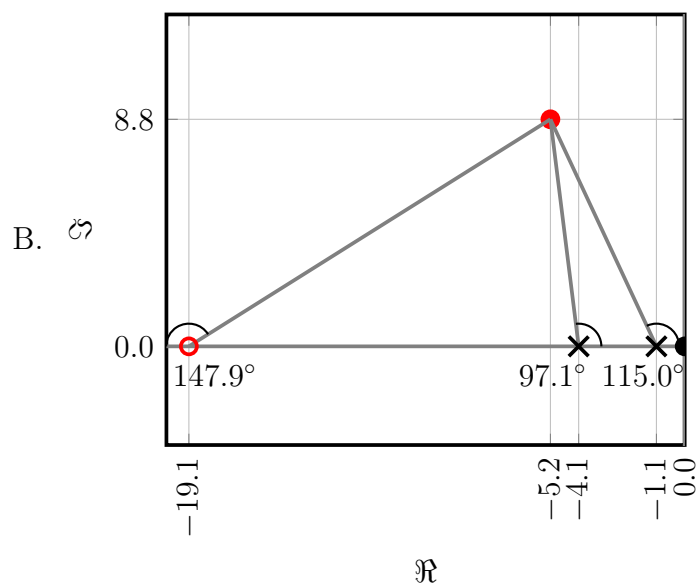

A zero is added so that the root-locus passes through this design point. Which of the following represents the correct angle condition for this design?
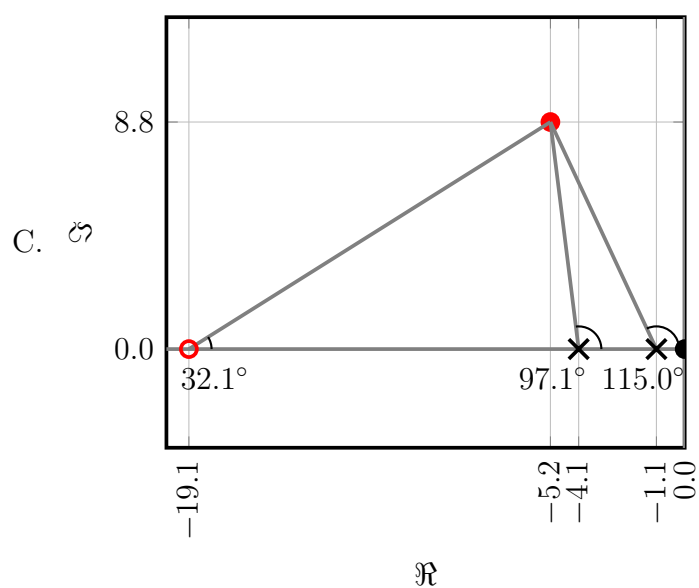
$$\sum \theta = 65.0° + 97.1° + 32.1° = 194.2°$$

A.

B.

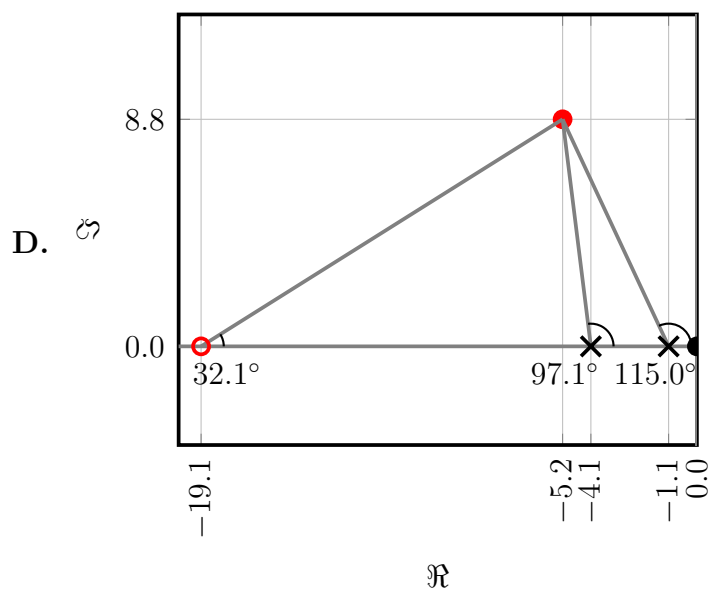$$\sum \theta = 115.0°+97.1°+147.9° = 360.0°$$

C.

$$\sum \theta = 115.0°+97.1°+32.1° = 244.3°$$

$$\sum \theta = 115.0° + 97.1° - 32.1° = 180.0°$$

D.

$$\sum \theta = 115.0° + 82.9° + 32.1° = 230.1°$$

E.

Q	A
1	A
2	A
3	D