1. (35 points) An open-loop transfer function is given by,
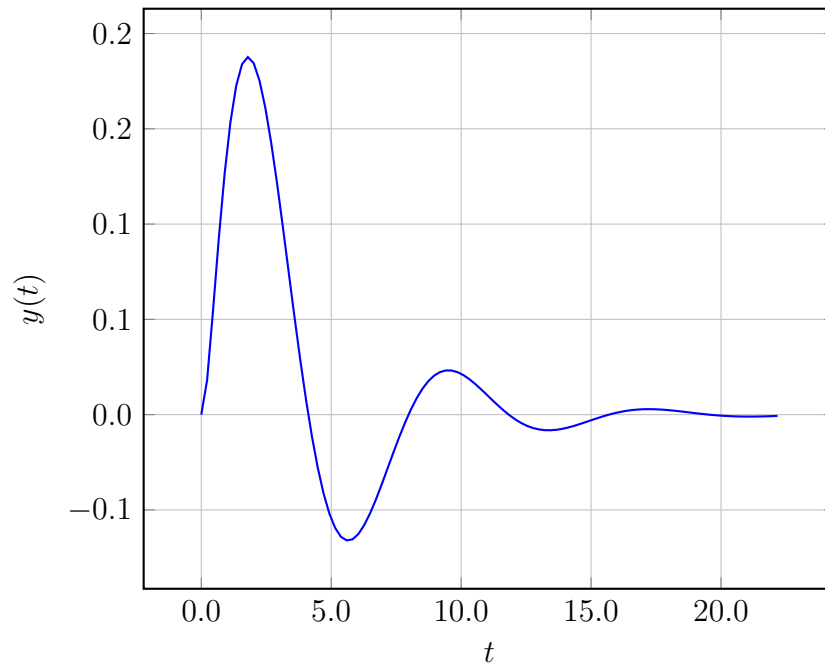
$$G(s) = \frac{1}{s^3 + 2.0s^2 + 3.35858s + 7.35858}$$

Which of the following PI controllers stabilizes the system in a unit-feedback closed-loop configuration?
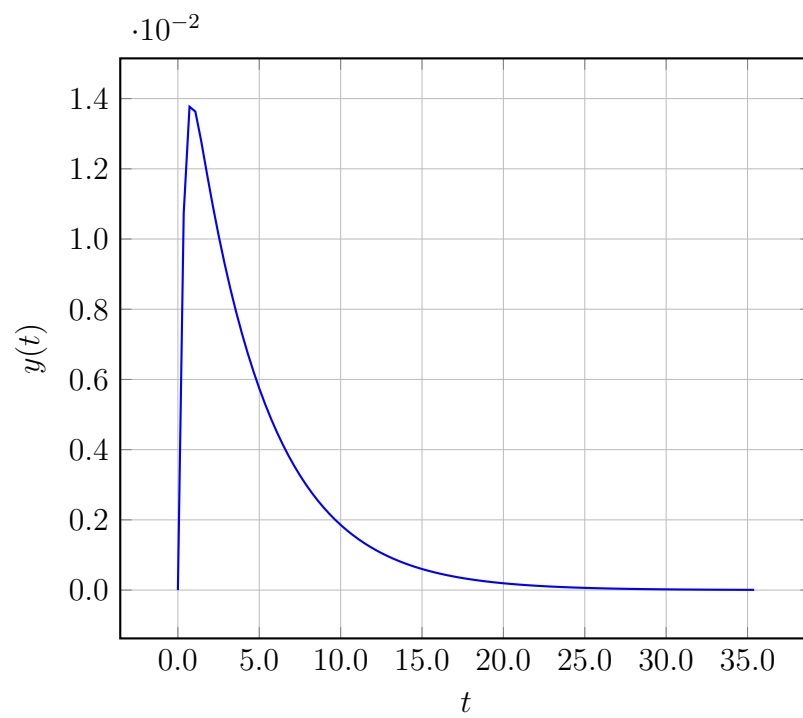
A. $F(s) = -8.56566 + \frac{1.71716}{s}$

B. $F(s) = -3.21716 + \frac{0.85858}{s}$

C. $F(s) = 2.6515 + \frac{1.71716}{s}$

D. $F(s) = -7.8485 + \frac{3.21716}{s}$

E. $F(s) = 1.93434 + \frac{3.21716}{s}$

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?
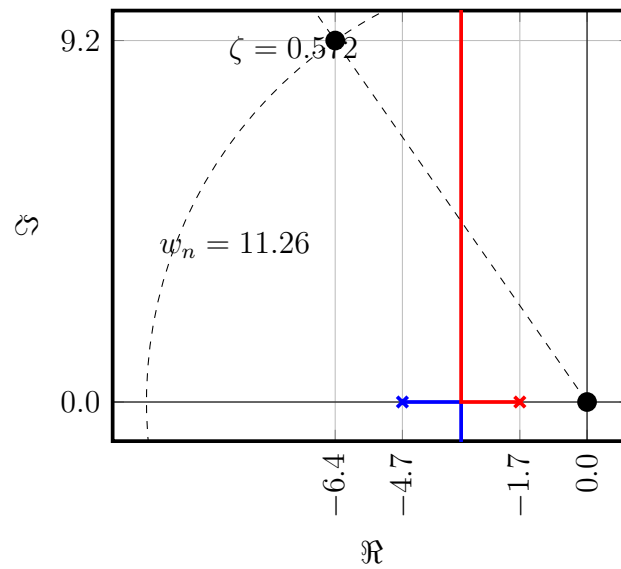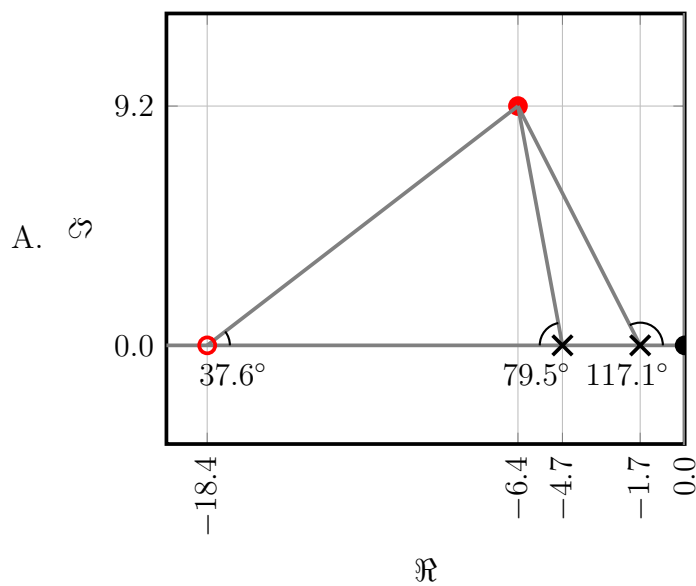
A.

B.

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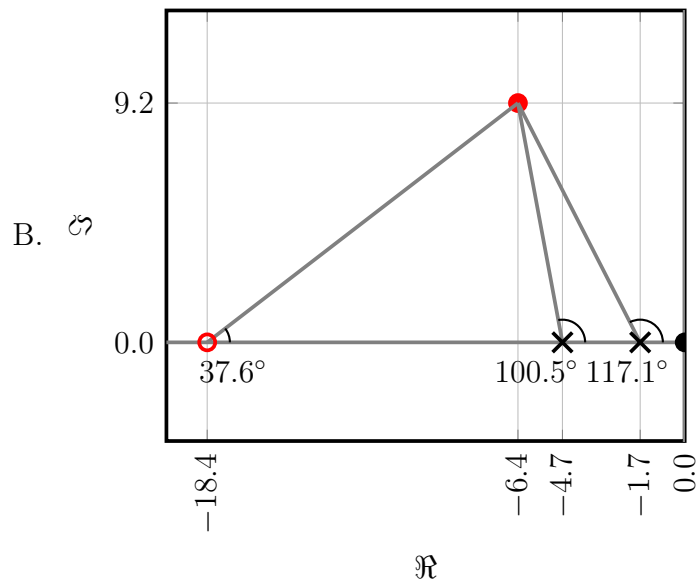

A zero is added so that the root-locus passes through this design point. Which of the following represents the correct angle condition for this design?
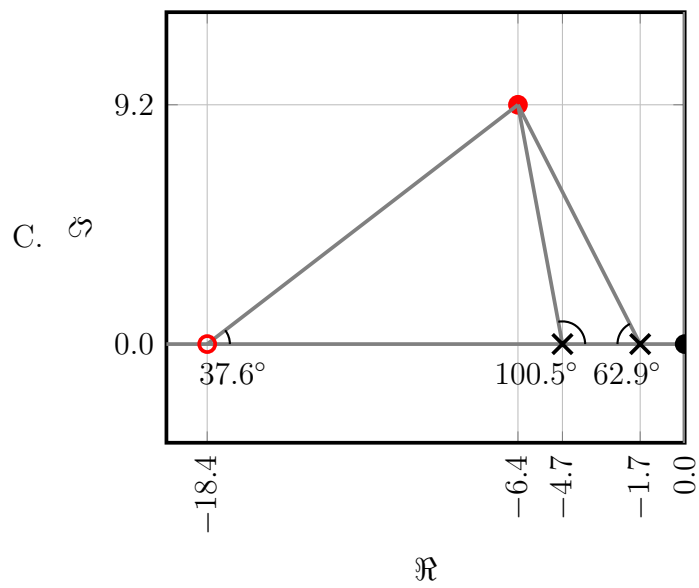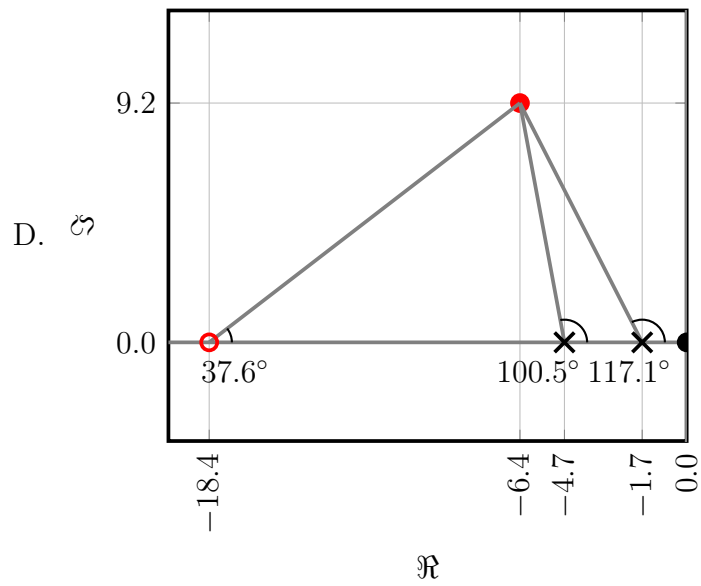
$$\sum \theta = 117.1° + 79.5° + 37.6° =$$

A.

$$\sum \theta = 117.1° + 100.5° + 37.6° =$$

B.

$$\sum \theta = 62.9° + 100.5° + 37.6° =$$

C.

$$\sum \theta = 117.1° + 100.5° - 37.6° =$$

D.

$$\sum \theta = 117.1° + 100.5° + 142.4° =$$

E.