

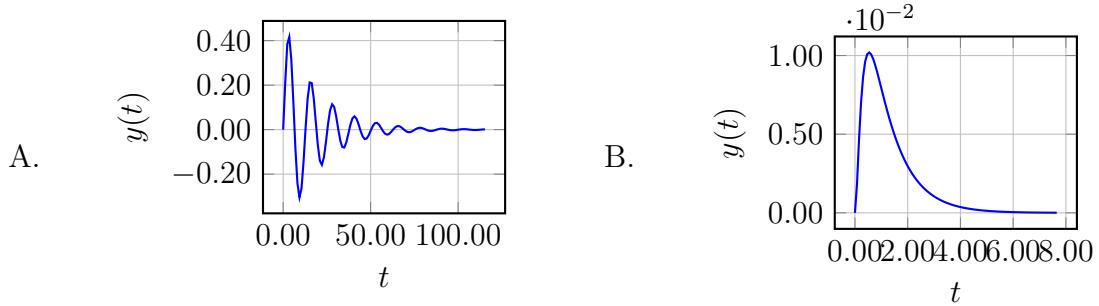
1. (35 points) An open-loop transfer function is given as,

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

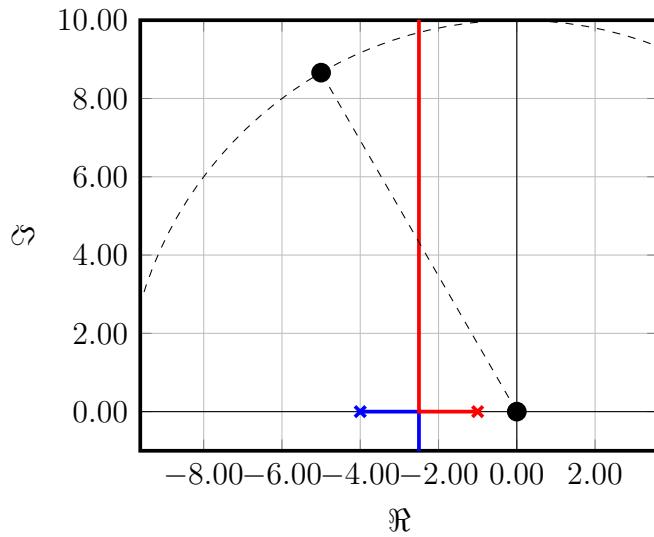
which of the following PI-controllers stabilizes the system in a closed-loop unit feedback structure?

- 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  $t_s = 1\text{ s}$  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?

- A. 1

