

Example 2

$$KG(s) = \frac{0.01 (s^2 + 0.01s + 1)}{s^2 \left(\frac{s^2}{4} + 0.02\frac{s}{2} + 1 \right)} \quad \text{— already in Bode form}$$

What can we tell about phase?

- ▶ low-frequency term $\frac{0.01}{(j\omega)^2}$ with $K_0 = 0.01$, $n = -2$
— phase starts at $n \times 90^\circ = -180^\circ$
- ▶ complex zero with break-point at $\omega_n = 1$ — phase up by 180°
- ▶ complex pole with break-point at $\omega_n = 2$ — phase down by 180°
- ▶ since ζ is small for both pole and zero, the transitions are very sharp