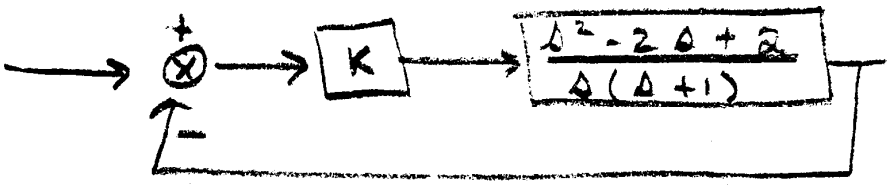
ECE 460 Q 9 MARCH 28, 2001

NAME:

HONOR CODE:

KEY

DRAW THE ROOT LOCUS FOR



Find the breakaway / break-in points and the jω axis crossings.

poles $s=0$, $s=-1$ zeros $s = 1 \pm j$

Breakaway pts: $\frac{1}{\sigma} + \frac{1}{\sigma+1} = \frac{1}{\sigma-(1+j)} + \frac{1}{\sigma-(1-j)}$

$$\frac{2\sigma+1}{\sigma(\sigma+1)} = \frac{2\sigma-2}{\sigma^2-2\sigma+2}$$

$$2\sigma^3 - 4\sigma^2 + 4\sigma + \sigma^2 - 2\sigma + 2 = 2\sigma^3 + 2\sigma^2 - 2\sigma^2 - 2\sigma$$

$$-3\sigma^2 + 2\sigma + 2 = -2\sigma$$

$$3\sigma^2 - 4\sigma - 2 = 0$$

$$\sigma = \frac{+4}{6} \pm \frac{\sqrt{16-4(-2)(3)}}{6}$$

$$= \frac{2}{3} \pm 1.054 = \begin{cases} -0.387 \\ 1.7207 \end{cases}$$

jw axis crossings

$s(s+1)+K(s^2-2s+2)$ $\qquad$ $s^2(1+K)+s(1-2K)+2K$

			+	−
s^2	$1+K$	$2K$	$K>-1$	$K<-1$
s^1	$1-2K$		$K<1/2$	$K>1/2$
s^0	$2K$		$K>0$	$K<0$

stable when $0 < K < \frac{1}{2}$

jw axis roots at $K = 1/2$

$s^2(3/2) + s(0) + 1 = 0$

$s^2 = -\frac{2}{3}$ $\qquad$ $s = \pm j\sqrt{\frac{2}{3}}$