

**MATH/BIOL 255: Mathematics in Medicine and Biology**

**Homework 4**

**Due: Tuesday 10/04 3:30 PM**

1) (Text problem 1.15) In the equations of the fetal circulation, assume  $R_d = 0$ ,  $K_R = K_L = K$  and  $R_p < R_s$ . This is roughly the situation just after birth with the ductus still open, the two sides of the heart roughly equal, but with the lungs expanded. Show that the closed-foramen solution ( $Q_f = 0$ ) is self-consistent. That is, show that assuming  $Q_f = 0$  in this case gives  $P_{sv} \leq P_{pv}$  [4 pts]. Then, find  $Q_d$  as a function of  $P_{pv}$ ,  $K$ ,  $R_p$ , and  $R_s$  and show it must be negative when  $R_p < R_s$  [2 pts].