1 Heat shields

A black (nonreflective) sheet of metal at high temperature T_h is parallel to a cold black sheet of metal at temperature T_c. Each sheet has an area A which is much greater than the distance between them. The sheets are in vacuum, so energy can only be transferred by radiation.

(a) Solve for the net power transferred between the two sheets.

(b) A third black metal sheet is inserted between the other two and is allowed to come to a steady state temperature T_m. Find the temperature of the middle sheet, and solve for the new net power transferred between the hot and cold sheets. This is the principle of the heat shield, and is part of how the James Web telescope shield works.

(c) **Optional:** Find the power through an N-layer sandwich.