Problem 1 *System simplification* 25 points

Simplify the system diagram using block diagram algebra:

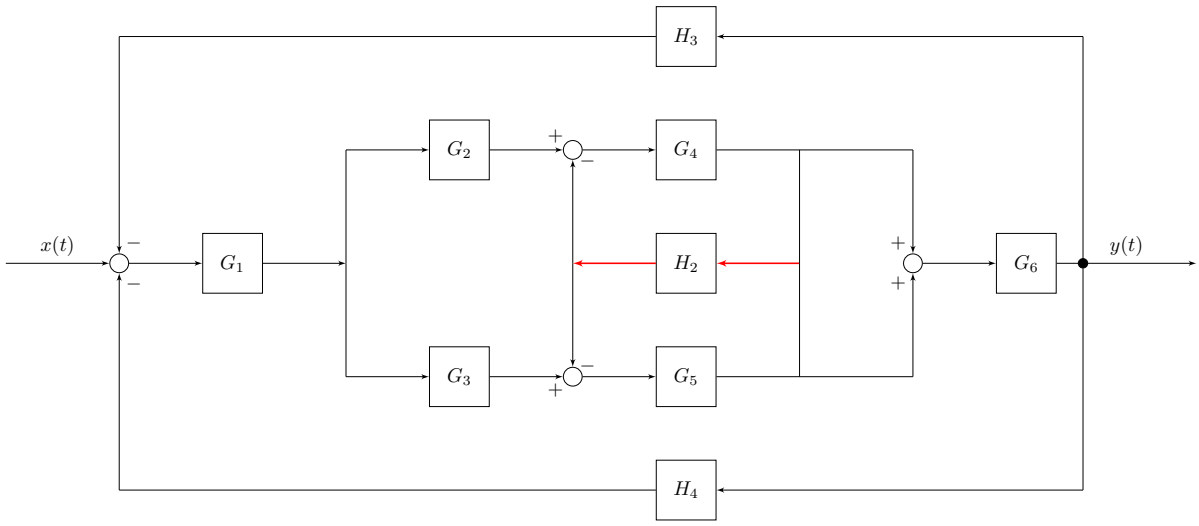

Figure 1: Simplify the system diagram down to one block

Note: Note the thick red connections. These indicate that those lines can carry *different* independent signals (here one coming from G_4 and one coming from G_5) without mixing/summing.

Problem 2 *System simplification & response* 25 points

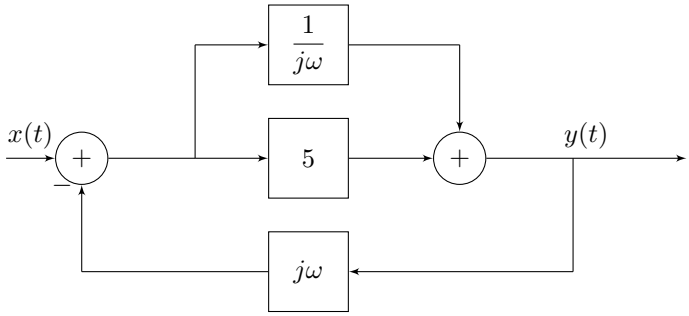

Figure 2: Simplify the system diagram down to one block

(a) Find the transfer function for the system depicted above.
(b) Find the system output to $x(t) = 5\cos(5t - 30°)$.

Problem 3 *More system simplification & response* 25 points

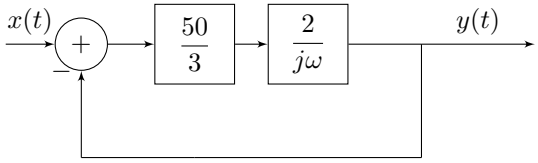

Figure 3: Simplify the system diagram down to one block

(a) Find the transfer function for the system depicted above.
(b) Find the system output to $x(t) = 5\sin(5t - 30°)$.

Problem 4 *Okay . . . this is the last one.* 25 points

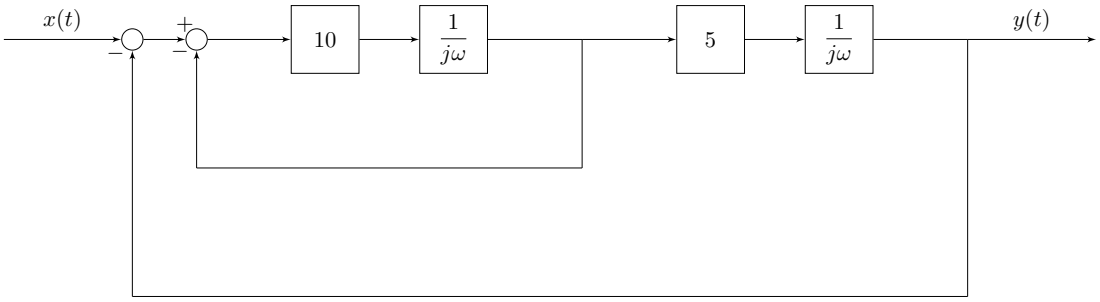

Figure 4: Simplify the system diagram down to one block

(a) Find the transfer function for the system depicted above.
(b) Find the system output to $x(t) = 5\sin(5t - 30°)$.