# COMMUNICATION THEORY, Homework Exercise 6 Fall 2023

Consider the following pictures (adapted from class exercise 1 of week 5), where a transmitter is combining two independent analog baseband signals x(t) and y(t) together to create a real-valued bandpass signal z(t). A receiver then extracts the original signals using mixers in a similar quadrature configuration and with the same carrier frequency f_c, followed by low-pass filters:
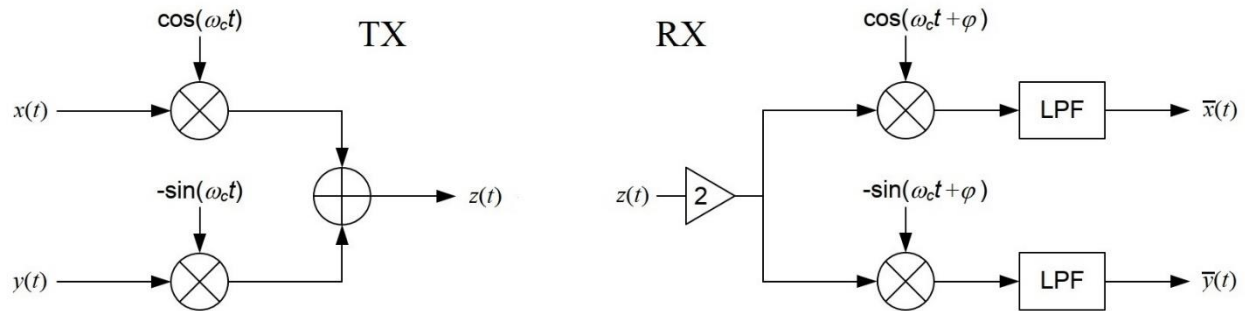
However, in this case the receiver mixers are not correctly synchronized with those of the transmitter, and instead have a phase offset φ. Use similar mathematical derivations as in class exercise 1 of week 5 to find an expression of the receiver outputs $\overline{x}(t)$ and $\overline{y}(t)$, and then show what happens to the outputs in particular when $\varphi = \pi/4$ and $\varphi = \pi/2$.