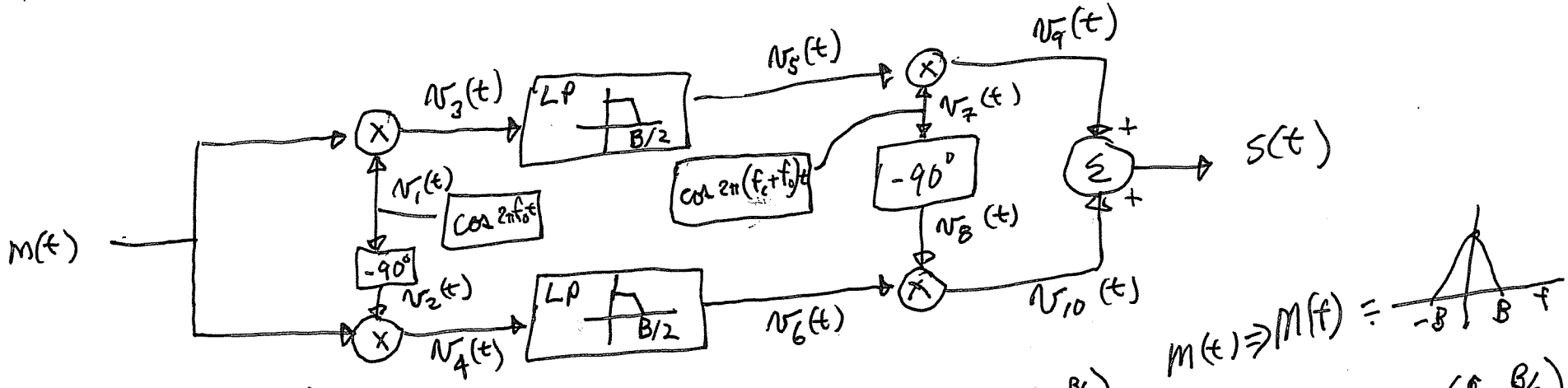
EE511 Lecture 18

High performance SSB methods

We will use mixing and Hilbert transform to achieve SSB instead of bandpass filtering.

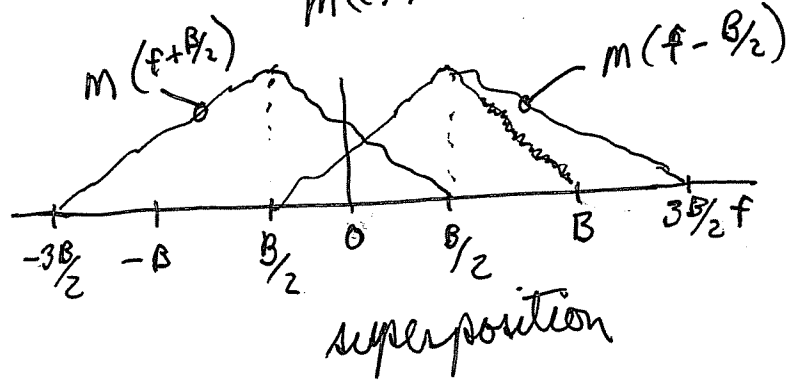
EX: Weavers Method for SSB let $f_0 = B/2$



$v_1(t) = \cos 2\pi f_0 t$

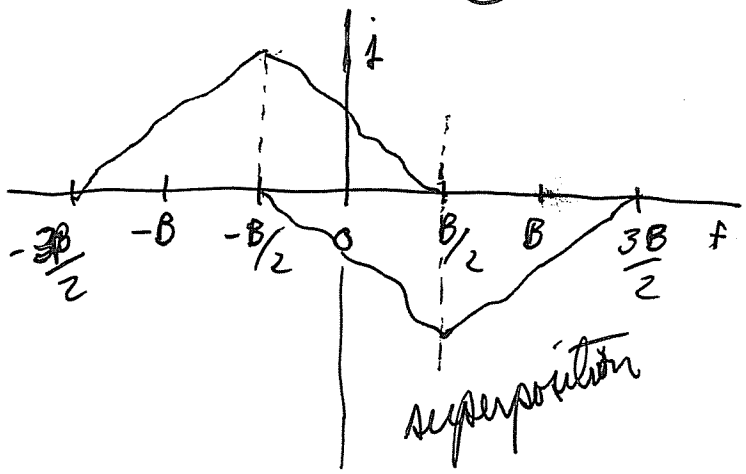
$v_2(t) = \sin 2\pi f_0 t$

$v_3(t) = m(t)\, v_1(t) = m(t) \cos\left(2\pi \frac{B}{2} t\right)$ ↔

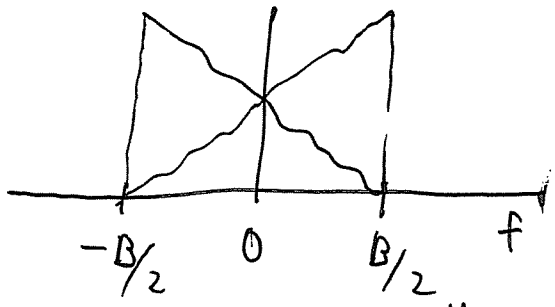


superposition

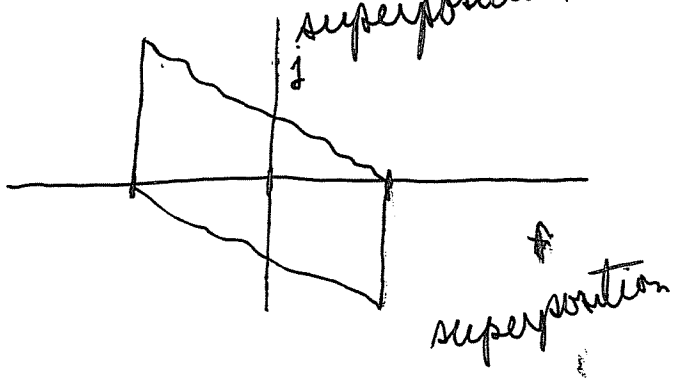
$v_4(t) = m(t)\, v_2(t) = m(t) \sin\left(2\pi \frac{B}{2} t\right) \leftrightarrow$



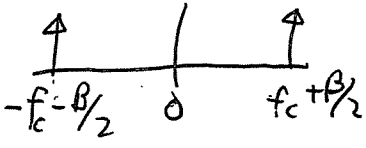
$V_5(f) =$



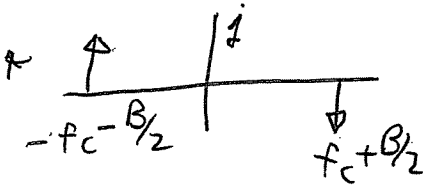
$V_6(f)$

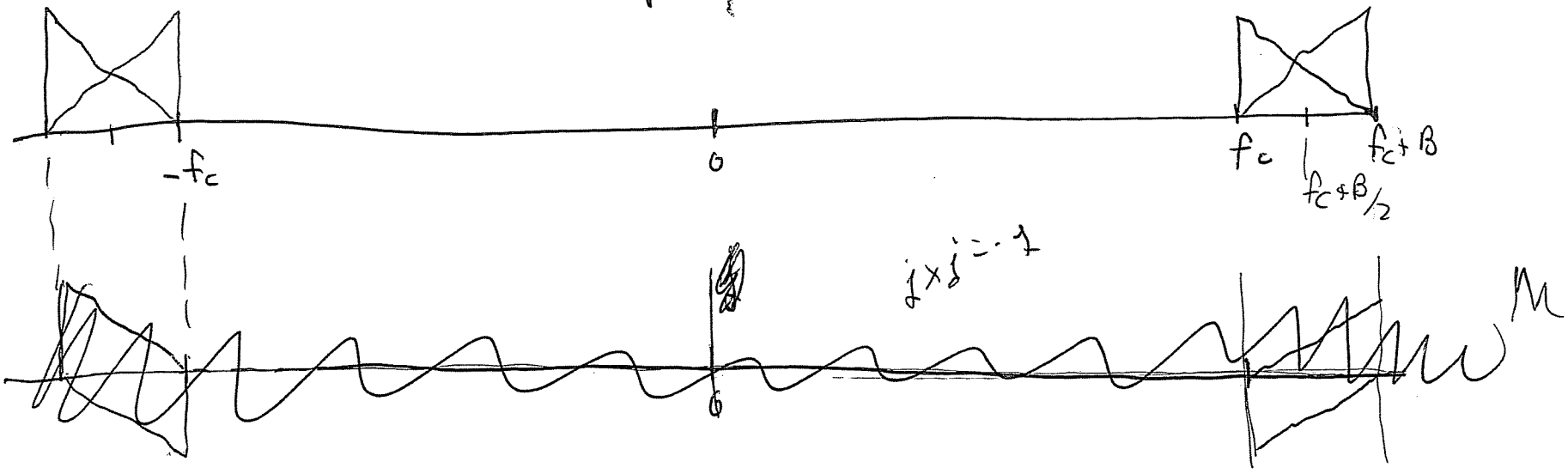


$V_9(f) = V_5(f) *$

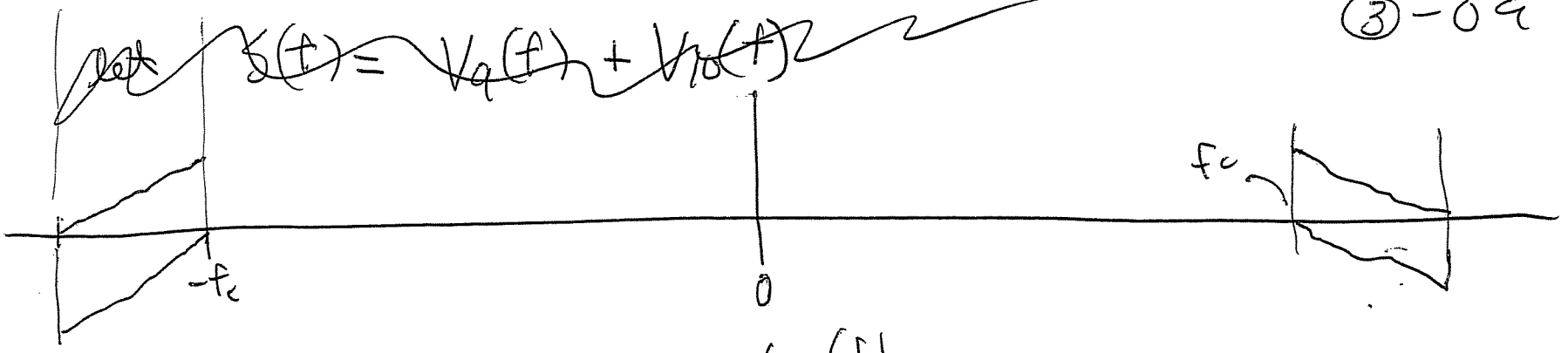


$V_{10}(f) = V_6(f) *$



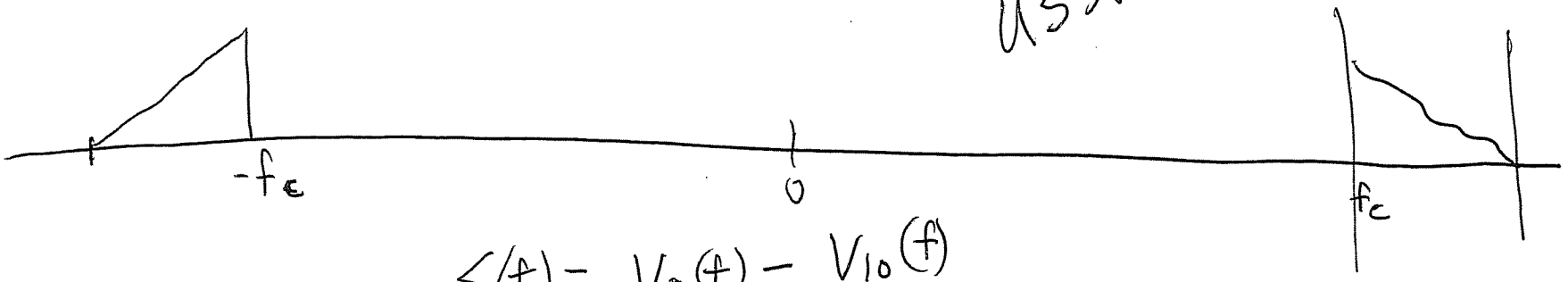


$S(f) = V_q(f) + V_{10}(f)$



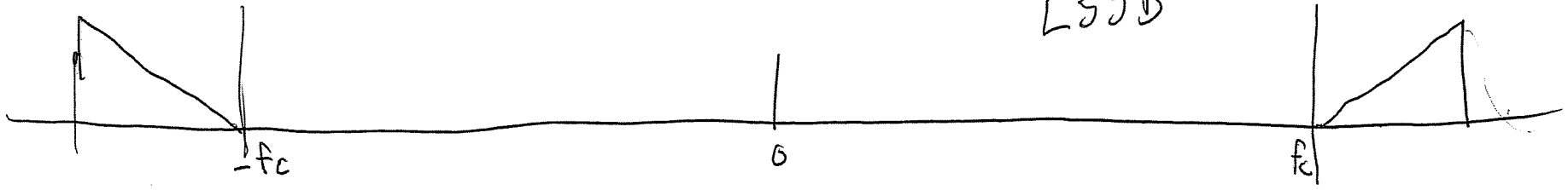
$S(f) = V_q(f) + V_{10}(f)$

USSB

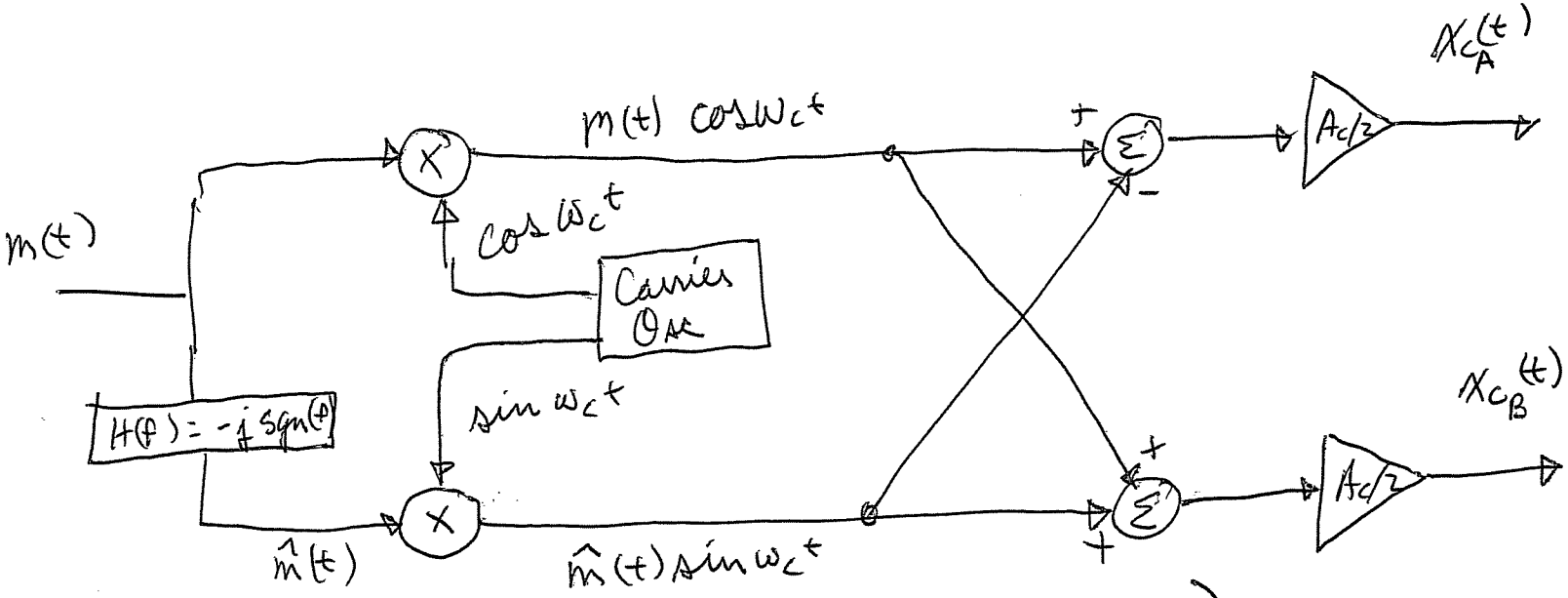


$S(f) = V_q(f) - V_{10}(f)$

LSSB



EX: Fig 3.8 in Ziemer 6 page 123



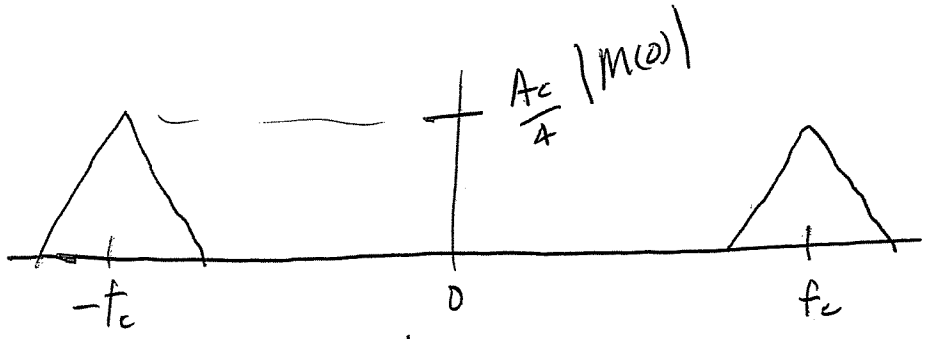
$$x_{c_A}(t) = \frac{A_c}{2}\left(m(t)\cos\omega_c t - \hat{m}(t)\sin\omega_c t\right)$$

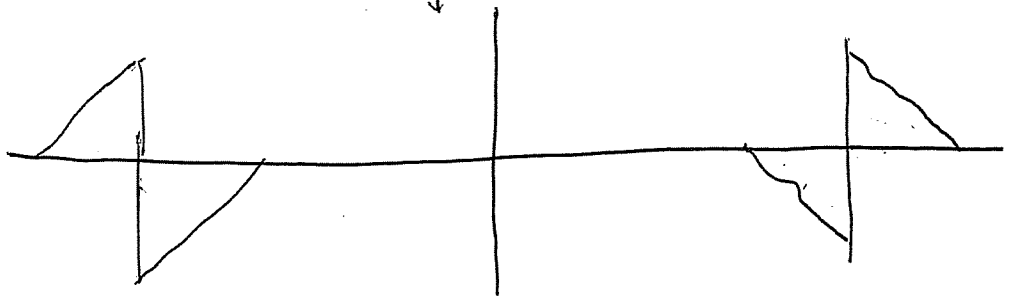
($\omega_c = 2\pi f_c$)

$$X_{c_A}(f) = \frac{A_c}{2}\left(\frac{M(f-f_c) + M(f-f_c)}{2} - \left[(-j\,M(f)\,\mathrm{sgn}(f)) * \frac{M(f-f_c) - M(f+f_c)}{2j}\right]\right)$$

? + for $X_{c_B}(f)$

$X_{CA}(f) =$





? polarity includes the subtraction

USSB

$X_{CB}(f) =$