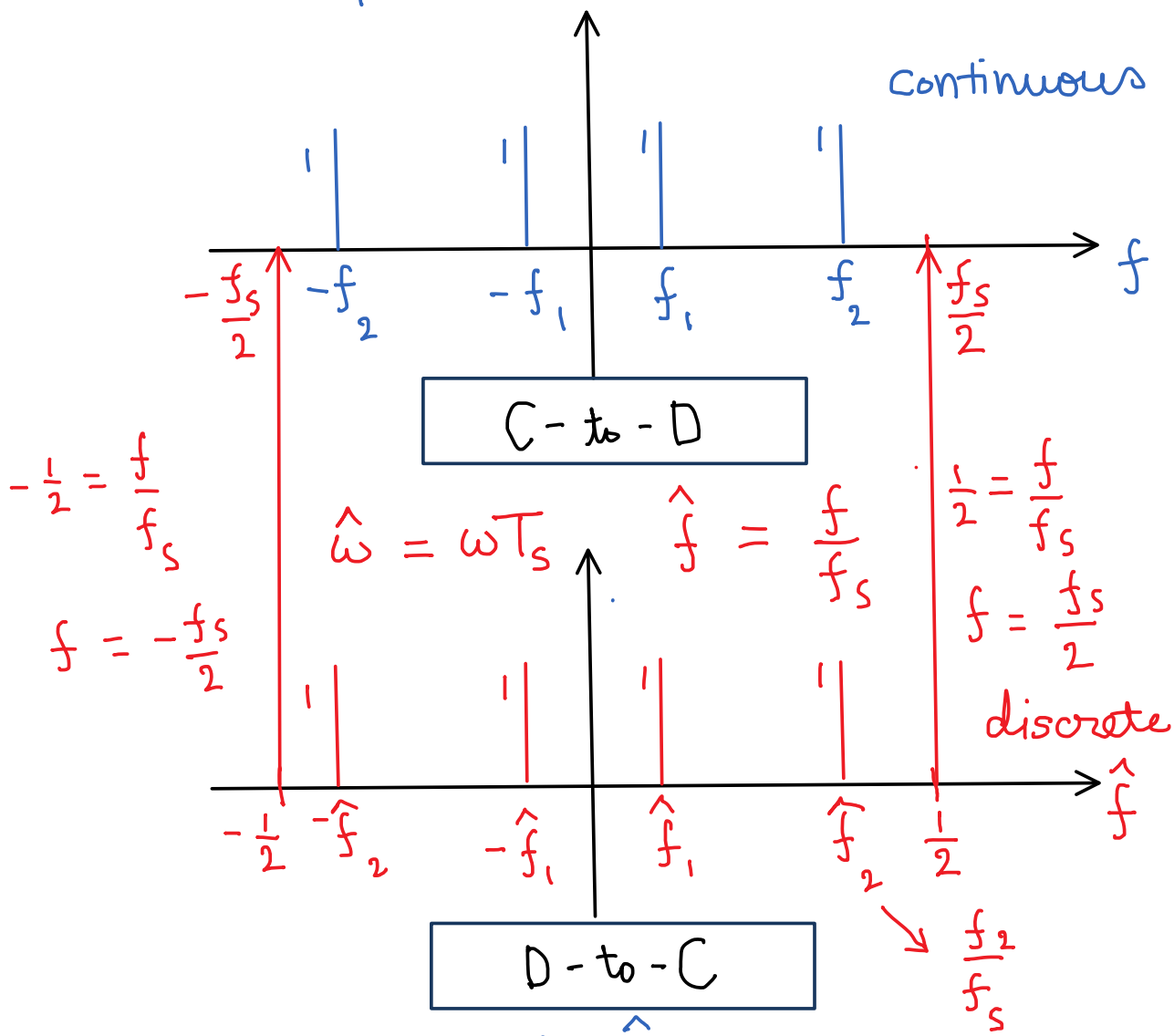
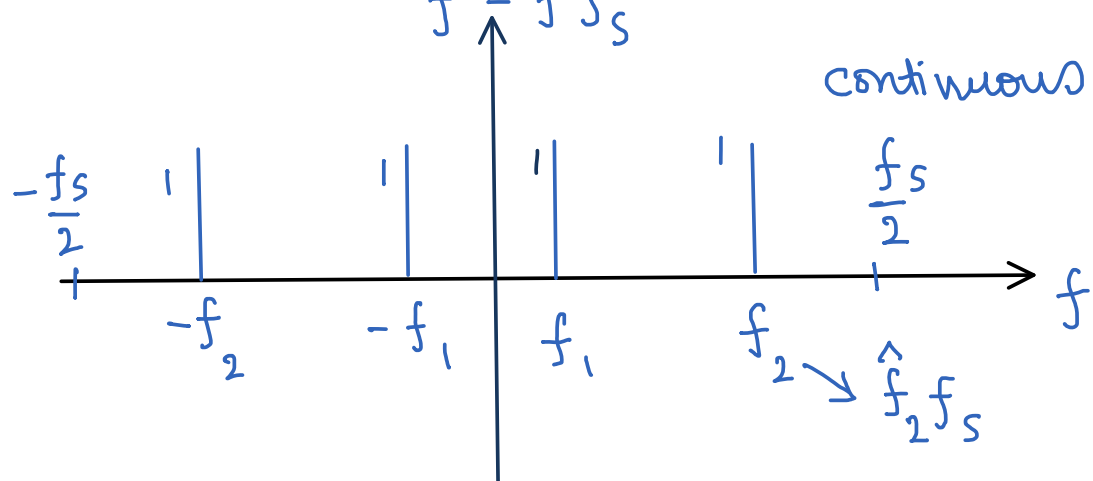
$$x(t) = 2\cos(2\pi f_1 t) + 2\cos(2\pi f_2 t)$$

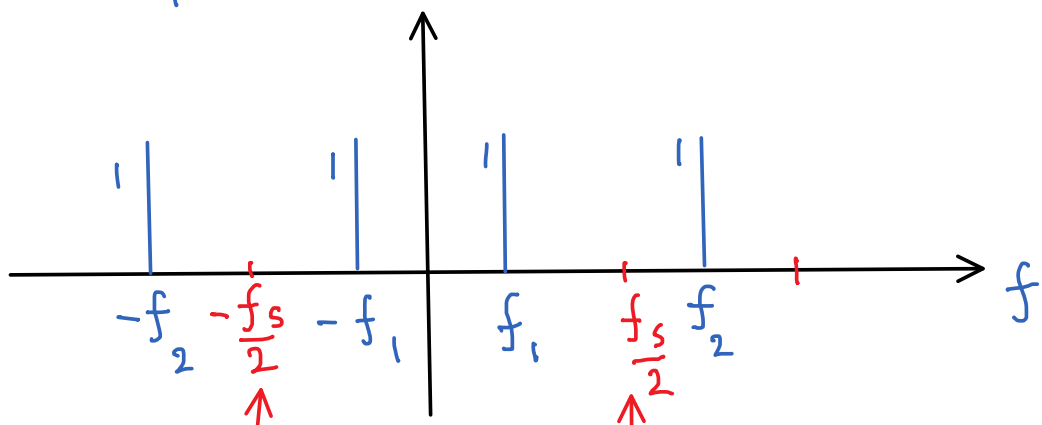


$$f = \hat{f} f_s$$



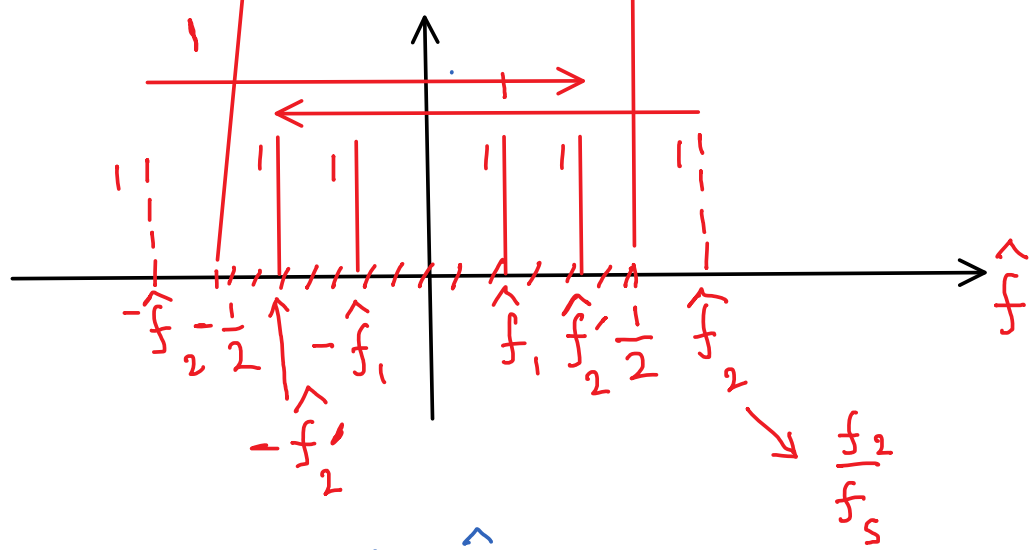
$$2\cos(2\pi f_1 t) + 2\cos(2\pi f_2 t)$$

$$x(t) = 2\cos(2\pi f_1 t) + 2\cos(2\pi f_2 t)$$



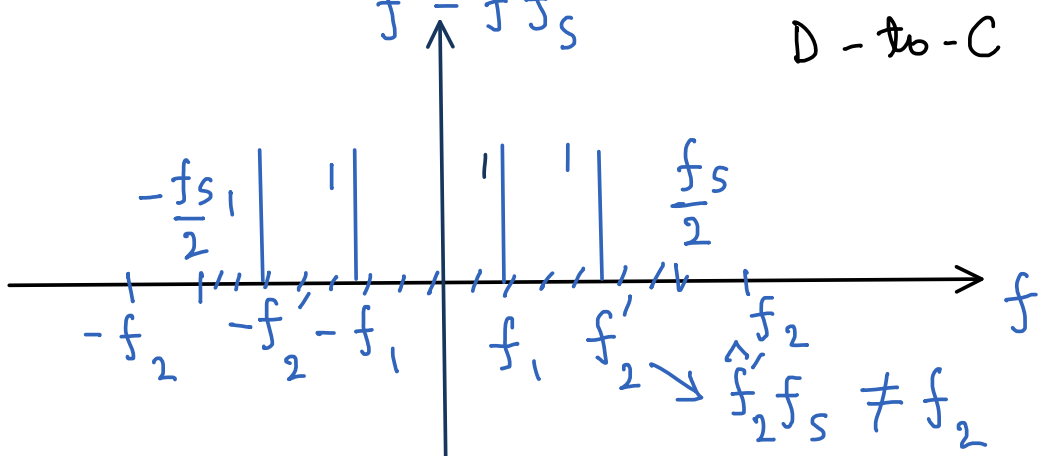
$$\hat{f} = \frac{f}{f_s}$$

C-to-D



$$f = \hat{f} f_s$$

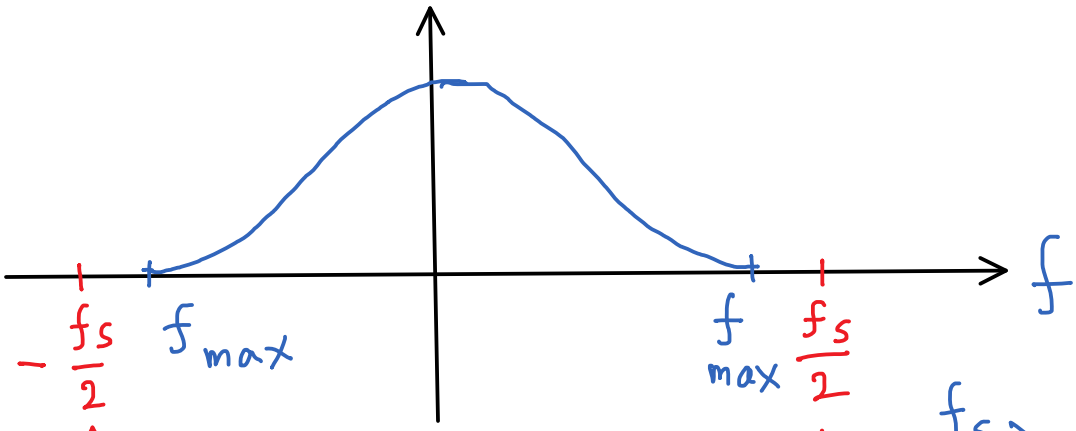
D-to-C



$$\hat{f}_2' f_s \neq f_2$$

$$2\cos(2\pi f_1 t) + 2\cos(2\pi f_2' t)$$

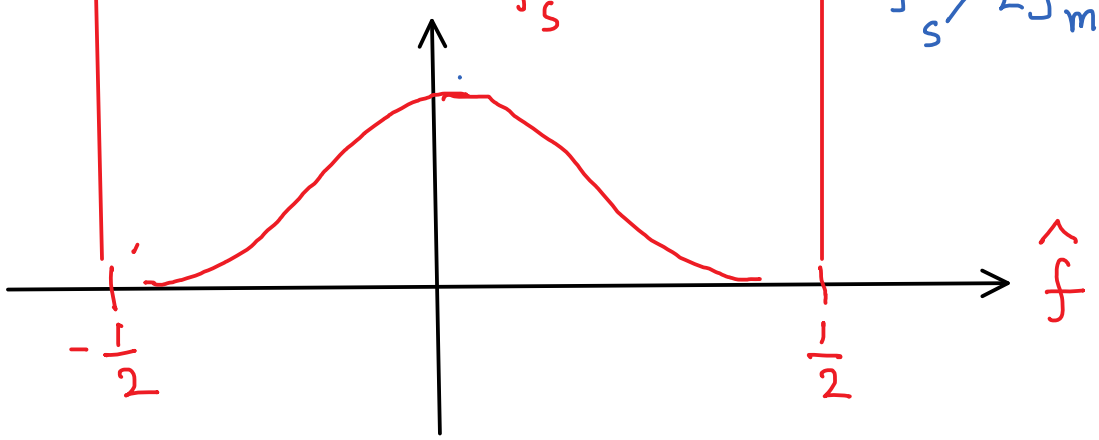
$$f_2' \neq f_2 !$$



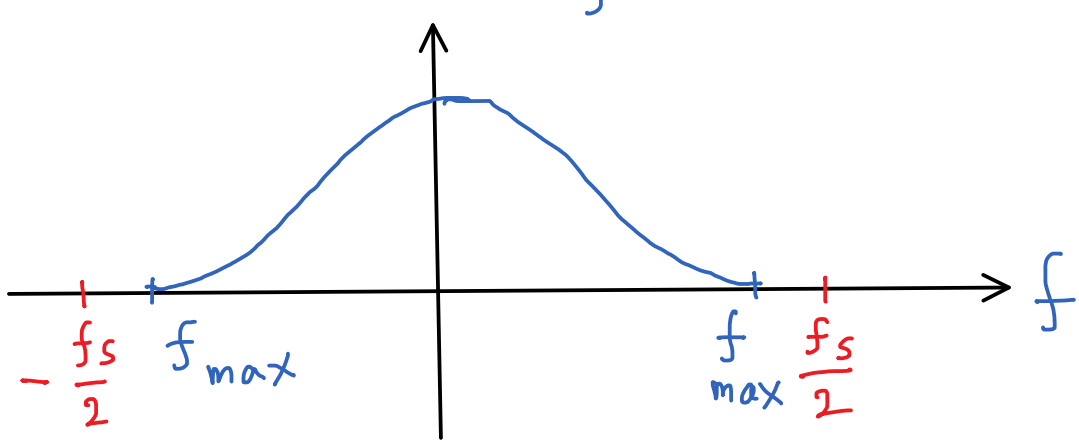
$\frac{f_s}{2} > f_{max}$

$f_s > 2f_{max}$

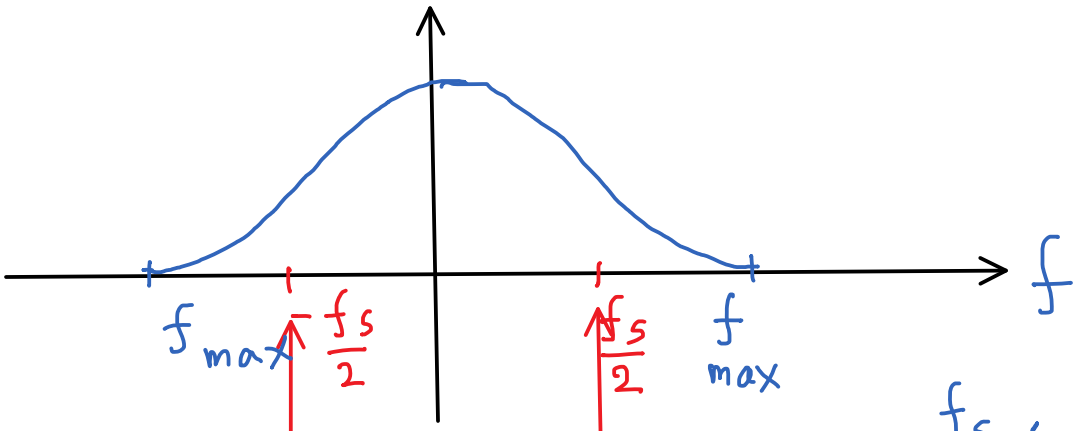
$\hat{f} = \frac{f}{f_s}$ C-to-D



$f = \hat{f} f_s$ D-to-C



original signal is recovered

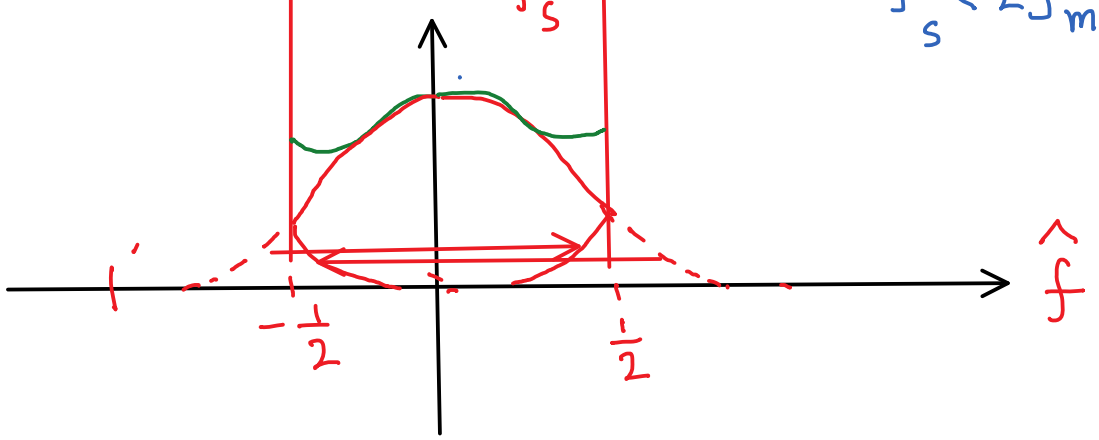


$\frac{f_s}{2} < f_{max}$

$f_s < 2 f_{max}$

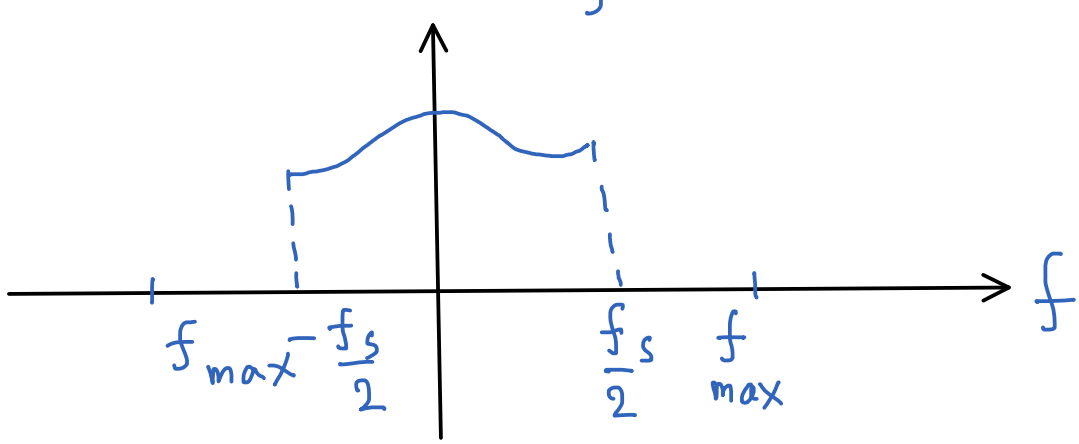
C-to-D

$\hat{f} = \frac{f}{f_s}$

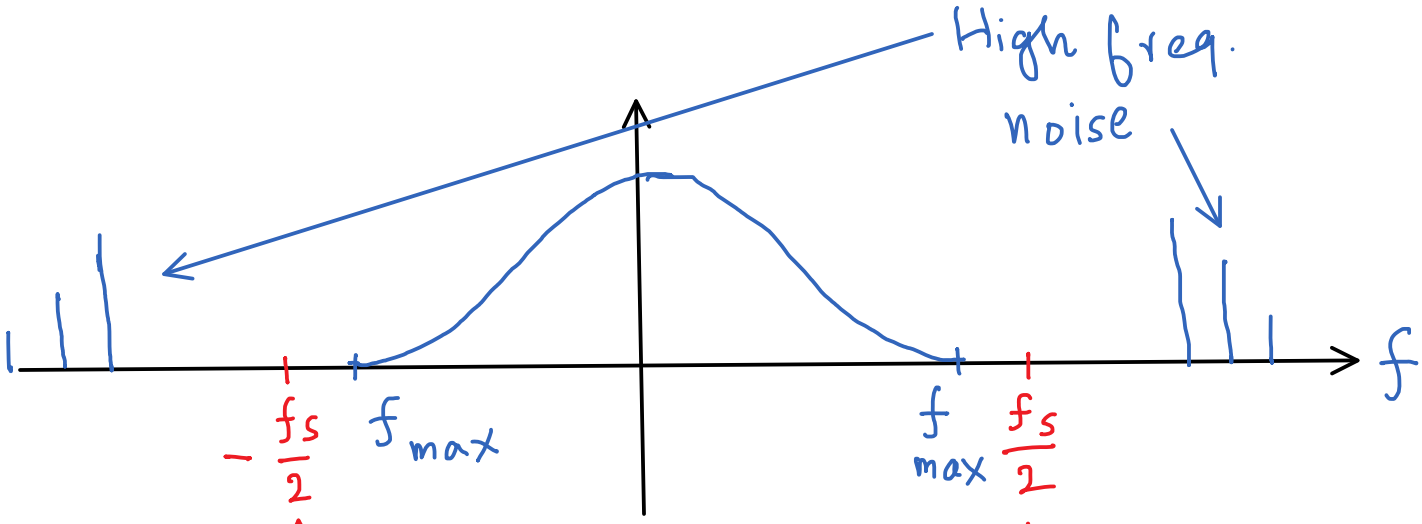


$f = \hat{f} f_s$

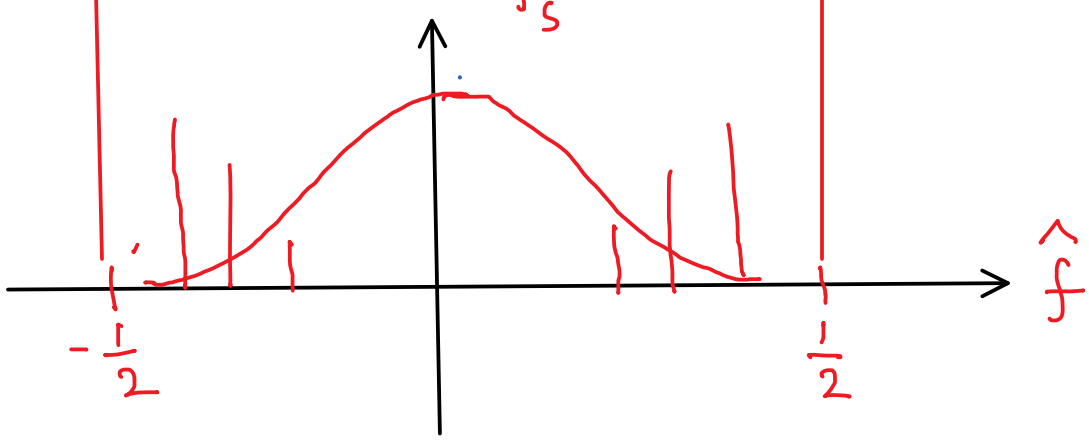
D-to-C



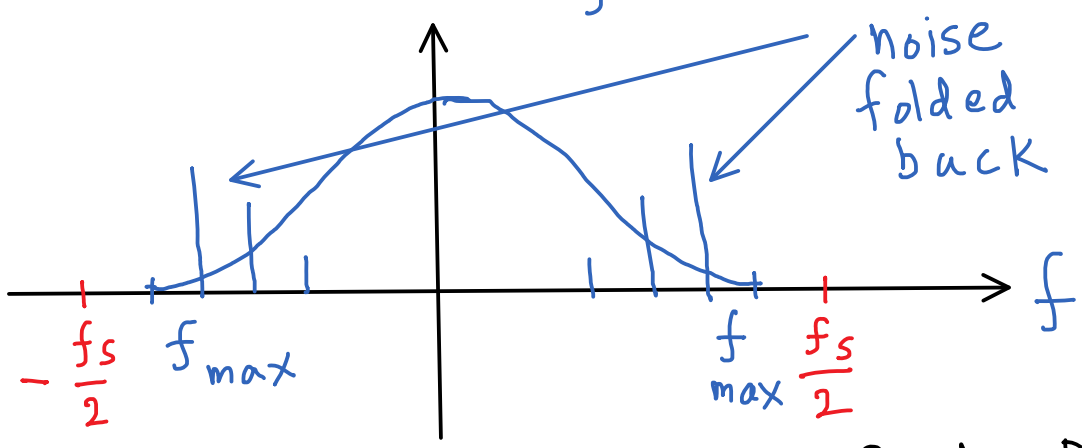
original signal is distorted!



$\hat{f} = \frac{f}{f_s}$ C-to-D



$f = \hat{f} f_s$ D-to-C



Solution: Filter noise out before C-to-D!
(Analog Anti Alias filter)