Problem 2.1

    a)

$$A = 13$$

$$w_0 = 1300000\pi$$

$$\theta = 30°$$

    b)

$$A = 0.5$$

$$w_0 = 960000\pi$$

$$\theta = -15°$$

    c)

$$A = 200$$

$$w_0 = 720000\pi$$

$$\theta = 45°$$

    d)

$$A = 125$$

$$w_0 = 540000\pi$$

$$\theta = -25°$$

    e)

$$A = 0.001$$

$$w_0 = 1200000\pi$$
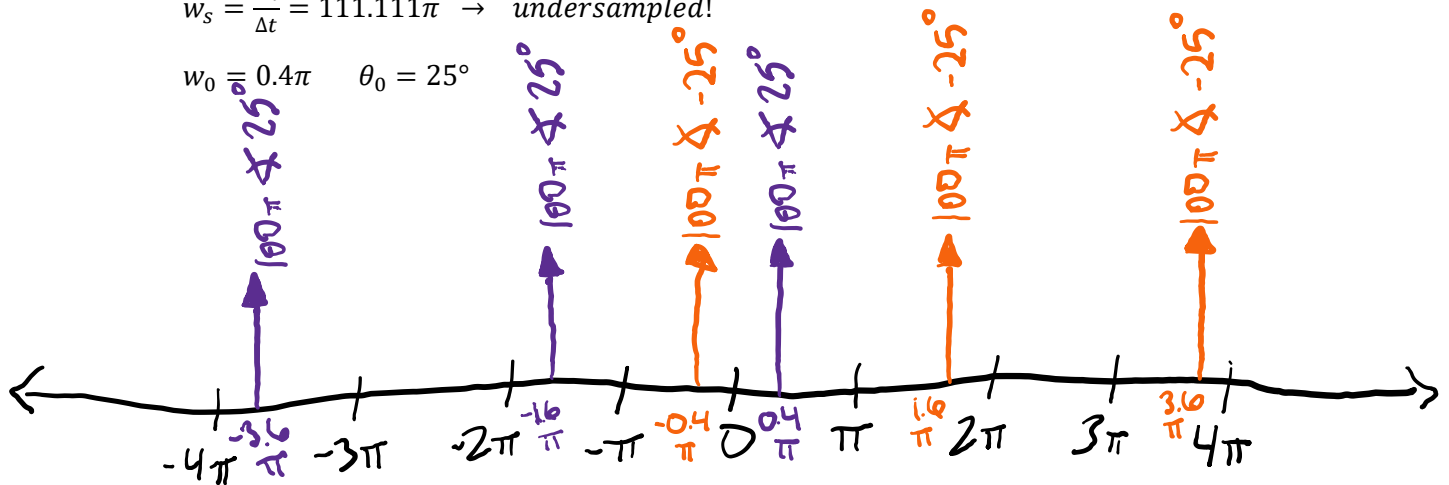
$$\theta = -37°$$

Problem 2.2

a)

$T_s = \Delta t = 18ms = 0.018s$

$\hat{w}_A = 200\pi * 0.018 = 3.6\pi$

$w_s = \frac{2\pi}{\Delta t} = 111.111\pi \quad \rightarrow \quad undersampled!$
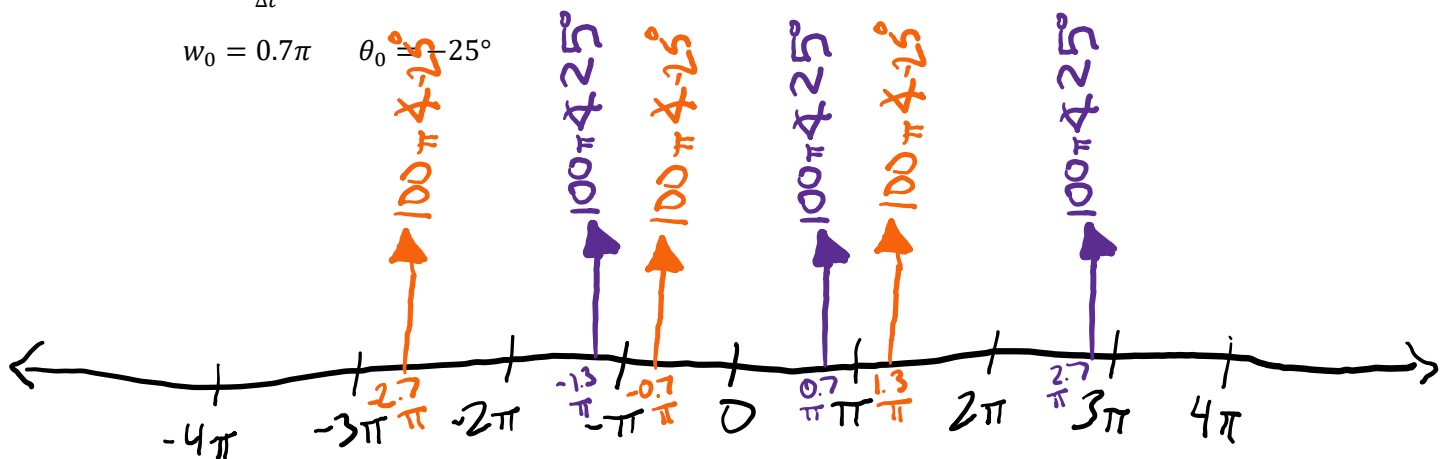
$w_0 = 0.4\pi \qquad \theta_0 = 25°$

b)

$T_s = \Delta t = 13.5ms = 0.0135s$

$\hat{w}_A = 200\pi * 0.0135 = 2.7\pi$

$w_s = \frac{2\pi}{\Delta t} = 148.148\pi \quad \rightarrow \quad oversampled!$
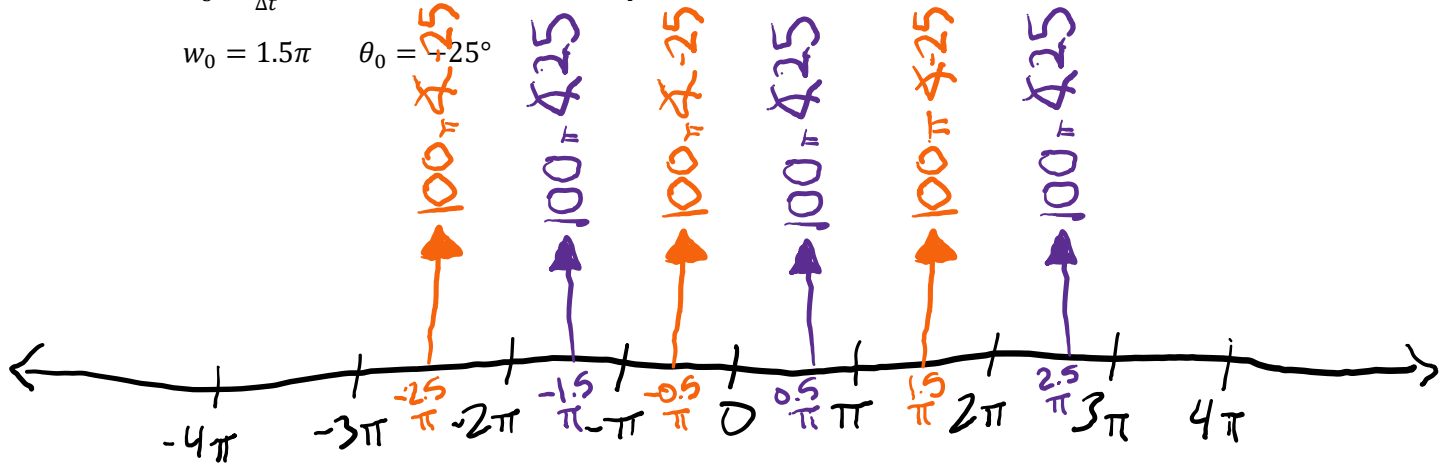
$w_0 = 0.7\pi \qquad \theta_0 = -25°$

c)

$T_s = \Delta t = 7.5ms = 0.0075s$

$\widehat{w}_A = 200\pi * 0.0075 = 1.5\pi$

$w_s = \frac{2\pi}{\Delta t} = 266.666\pi \rightarrow oversampled!$
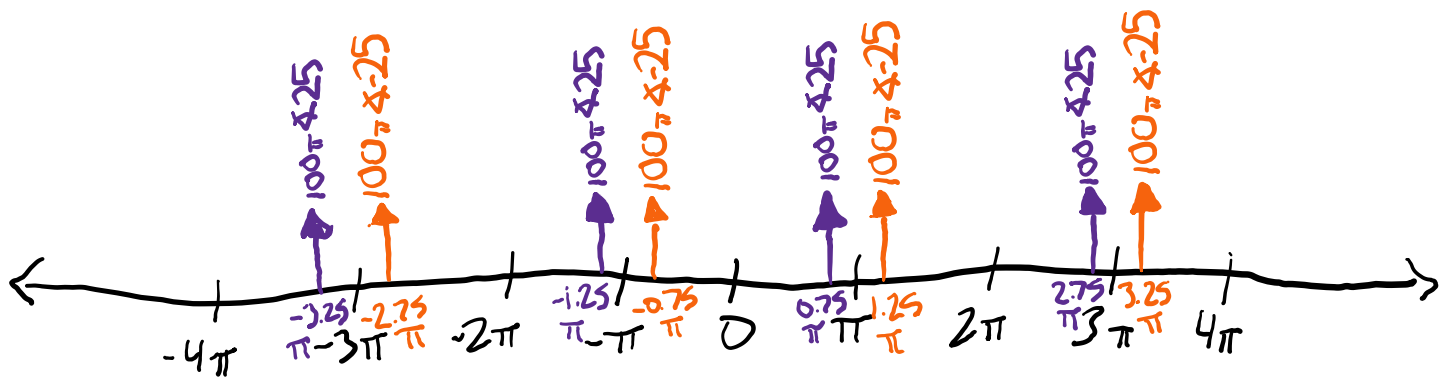
$w_0 = 1.5\pi \qquad \theta_0 = -25°$

d)

$T_s = \Delta t = 3.75ms = 0.00375s$

$\widehat{w}_A = 200\pi * 0.00375 = 0.75\pi$

$w_s = \frac{2\pi}{\Delta t} = 533.333\pi \rightarrow oversampled!$
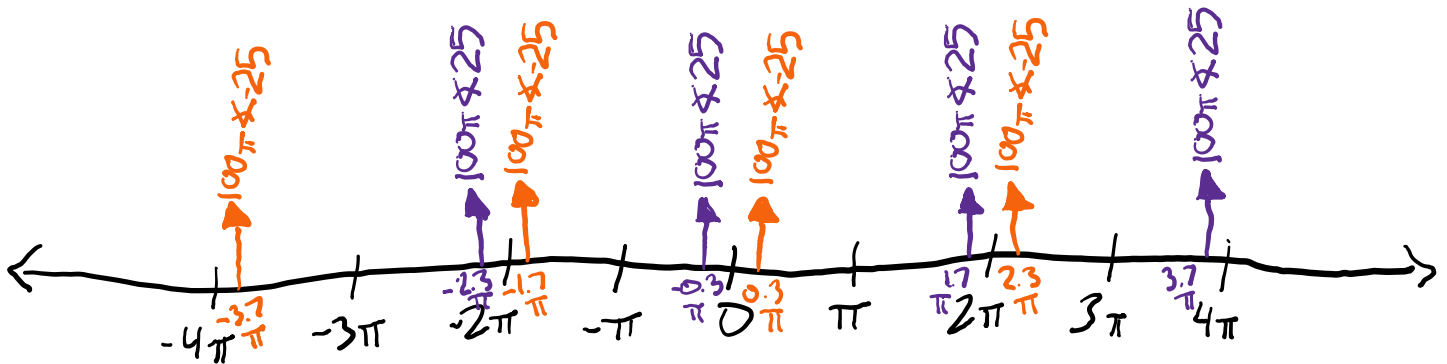
$w_0 = 0.75\pi \qquad \theta_0 = -25°$

e)

$$T_s = \Delta t = 1.5ms = 0.0015s$$

$$\hat{w}_A = 200\pi * 0.0015 = 0.3\pi$$

$$w_s = \frac{2\pi}{\Delta t} = 1333.333\pi \quad \rightarrow \quad oversampled!$$

$$w_0 = 0.3\pi \qquad \theta_0 = -25°$$

Problem 2.3

a) $f_a[n] = \sum_{-5}^{5} \sin(0.55\pi n + 17°)\, \delta[n - q]$

b) $f_b[n] = \sum_{-3}^{8} \sin(0.55\pi n + 17°)\, \delta[n - q]$

c) $f_c[n] = \sum_{0}^{\infty} (0.353553 \sphericalangle - 45°)^{n-1}\, \delta[n - q]$

d) $f_d[n] = \sum_{3}^{\infty} (1\sphericalangle - 60°)^{n-1}\, \delta[n - q]$

e) $f_e[n] = \sum_{3}^{\infty} (1\sphericalangle 60°)^{1-n}\, \delta[n - q]$

Problem 2.4

a) $f_a[n] = \sin(0.55\pi n + 17°)(u[n + 5] - u[n - 6]$

b) $f_b[n] = \sin(0.55\pi n + 17°)(u[n + 3] - u[n - 09]$

c) $f_c[n] = (0.35 \sphericalangle 45°)^{n-1}(u[n])$

d) $f_d[n] = (1\sphericalangle - 60°)^{n-1}(u[n + 5])$

e) $f_e[n] = (1\sphericalangle 60°)^{1-n}(u[n - 3])$