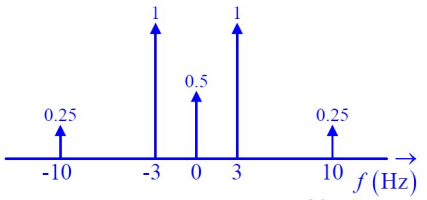
EE2023 Signals and Systems Mid-term Quiz – AY2015/2016 Semester 1

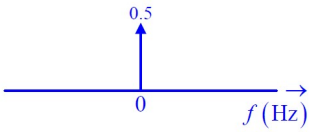
Q1(a). $X_1(f) = 0.5\delta(f) - 0.25\left[\delta(f+10) + \delta(f-10)\right] + \left[\delta(f+3) + \delta(f-3)\right]$

$X_2(f) = 0.5\delta(f)$

Q1(b).

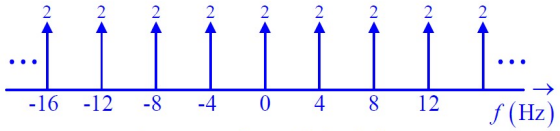


Amplitude Spectrum of $x_1(t)$



Amplitude Spectrum of $x_2(t)$

Q1(c).



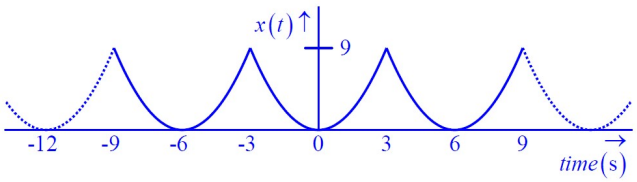
Spectrum of sampled $x_2(t)$

Q2(a). $X_1(f) = \dfrac{2}{\sqrt{\pi}} e^{-f^2/4}$

Q2(b). $X_2(f) = \dfrac{1}{j\sqrt{\pi} f} e^{-4\pi^2 f^2} + \sqrt{\pi}\delta(f)$

Q2(c). $X_3(f) = \dfrac{1}{\sqrt{\pi}}\left[e^{-(f+8)^2/4} + e^{-(f-8)^2/4}\right]$

Q3(a).



Q3(b). Fundamental frequency = 1/6 Hz.

Q3(c)i. DC value: $\frac{1}{6}\int_{-3}^{3} t^2 dt = 3$

Q3(c)ii. Truncation error = -0.264

Q4(a). $X(f) = \frac{18}{11}\sum_k \text{sinc}^2\left(\frac{3k}{11}\right)\cos\left(\frac{4\pi k}{11}\right)\delta\left(f - \frac{k}{11}\right)$

Q4(c). Average power of $x(t)$ = 116/33 = 3.5152