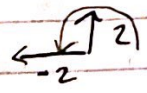
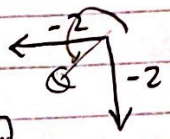
Quiz #2

① Find phase angle

If $z = -2 + 2j \Rightarrow$ 

So $\tan\theta = \frac{2}{-2} \Rightarrow \boxed{\theta = 135°}$

If $z = -2 - 2j \Rightarrow$ 

So $\tan\theta = \frac{-2}{-2} \Rightarrow \boxed{\theta = 225°}$

If $z = 2 - 2j$ 

So $\tan\theta = \frac{2}{-2} \Rightarrow \boxed{\theta = 315°}$

② a) $v(t) = 4\cos(2\pi(10)t + 30^\circ)$, $t = 0$

So it can be $4 * \cos(30)$

$\Rightarrow \underline{4 \angle 30}$

b) $v(t) = 2\sin(2\pi(10)t - 60^\circ)$, $t = 0$

$\Rightarrow 2\cos(2\pi(10)t - 60^\circ - 90^\circ)$

$= 2\cos(2\pi(10)t - 150)$

$= 2\cos(-150)$

$\underline{2 \angle -150}$

Fourier Analysis

$$f(x) = \begin{cases} 1, & 0 \le x < \pi \\ 0, & \pi < x \le 2\pi \end{cases}$$

① Phases versus frequency?

$$\mathcal{F}\{f(x)\} = \frac{1}{\sqrt{2\pi}} \int_0^{2\pi} f(x) e^{-iwx} dx$$

$$\Rightarrow \frac{1}{\sqrt{2\pi}} \left[\int_0^{\pi} 1 e^{-iwx} dx + \int_{\pi}^{2\pi} 0 \, e^{-iwx} dx \right]$$

$$= \frac{1}{\sqrt{2\pi}} \left[\frac{e^{-iex}}{-iw} \Big|_0^{\pi} \right]$$

$$= \frac{1}{\sqrt{2\pi}} \left[\frac{e^{-iw}}{-iw} - \frac{e^{-iw(\pi)}}{-iw} \right]$$

$$\Rightarrow \frac{1}{\sqrt{2\pi}} \left[\frac{1 - e^{-iw\pi}}{-iw} \right]$$

The fourier Transform has a magnitude equal to 0 to 2π

Probability and Statistics

① Uniform distribution, and normalized over $[0,1]$

$$f(x) = \frac{1}{b-a}$$

$$N = \frac{a+b}{2} \qquad r = \frac{\sqrt{(b-a)^2}}{12}$$

→ over $[0,1]$

a, b

$$P(x) = \frac{1}{1-0}, \quad 0 \le x \le 1$$

$$P(x) = 1, \quad 0 \le x \le 1$$

So then $\frac{1+0}{2} = \frac{1}{2}$.

$$N = \frac{1}{2}$$

$$r = \frac{\sqrt{(1-0)^2}}{12}$$

Standard deviation $= \frac{1}{\sqrt{12}}$