Quiz #2

1) Phase angle

a) $z = -2+2j$ Phase angle $= \phi = \tan^{-1}(b/a)$

$a=-2$ $b=2$

Phase angle, $\phi = \tan^{-1}\left(\frac{2}{-2}\right)$

$= \tan^{-1}(-1)$

$= \pi - \tan^{-1}(1)$

$= \pi - \frac{\pi}{4} = \boxed{\frac{3\pi}{4}}$

b) $z=-2-2j$

$a=-2, b=-2$

$\phi = \tan^{-1}\left(\frac{b}{a}\right) = \tan^{-1}\left(\frac{-2}{-2}\right)$

$= \pi + \tan^{-1}(1) = \pi + \frac{\pi}{4} = \boxed{\frac{5\pi}{4}}$

c) $z=2-2j$

$a=2>0, b=-2<0$

$\tan^{-1}\left(\frac{-2}{2}\right) = \tan^{-1}(-1)$

$= 2\pi - \tan^{-1}(1)$

$= 2\pi - \frac{\pi}{4} = \boxed{\frac{7\pi}{4}}$

2) Phasor @ $t=0$

a) $v(t) = 4\cos(2\pi(10.0)t + 30°)$

$\omega = \frac{2\pi}{T} = 2\pi n$

Here $\theta = 30° = \frac{\pi}{6}$, $A = 4$

$F = Ae^{j\theta} = 4e^{j(\pi/6)}$

b) $v(t) = 2\sin(2\pi(10.0)t - 60°)$

$V(t) = 2\sin(2\pi(10.0)t - 60°))$
$= 2\cos(90° - (2\pi(10.0)t - 60°)$
$= 2\cos(90° - 2\pi(10.0)t + 60°)$
$= 2\cos(150° - 2\pi(10.0)t)$
$= 2\cos(30° + 2\pi(10.0)t)$
$V(t) = 2\cos(2\pi(10.0)t + 30°)$

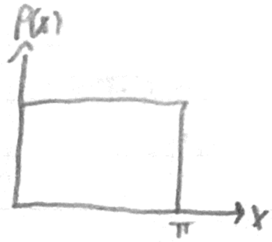
$F = Ae^{j\theta}$

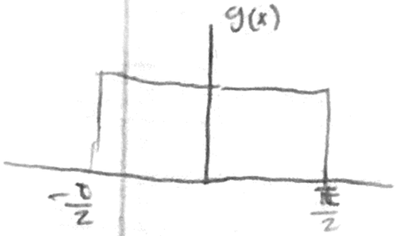
$\theta = 30° = \pi/6$, $A = 2$

$\boxed{F = 2e^{j\pi/6}}$

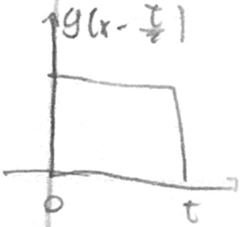
Fourier Series

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





$$\rightarrow A\tau \frac{\left(\sin \frac{\omega\tau}{2}\right)}{\frac{\omega\tau}{2}}$$



$$j\omega\, e^{-j\omega \frac{\tau}{2}}$$

$$F(\omega) = e^{-j\omega\left(\frac{\pi}{2}\right)}$$
$$= e^{-j\frac{\omega\pi}{2}}$$

$$F(\omega) = \frac{\pi}{2} \left(\frac{\omega\pi}{2}\right) \left[\cos\frac{\omega\pi}{2} - j\sin\frac{\omega\pi}{2}\right]$$

1) where phases versus frequency is
Phase $= \frac{\pi\omega}{2}$

2) Mag $- \pi/2$

$$\frac{\pi}{\tau/2},\ \frac{2\pi}{\tau/2}$$

$$\omega = \frac{\pi}{\tau/2} = 2$$

$$\omega = 2, 4, 6$$

Probability & Statistics

if X is uniformly distributed over $[a,b]$ then,

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

Statistical mean $\boxed{\mu = \frac{a+b}{2}}$

$$STD = \sqrt{\frac{(b-a)^2}{12}}$$

Here random variable is uniformly distributed over $[0,1]$

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

$$P(x) = 1$$

$$\mu = \frac{1+0}{2} = \boxed{\frac{1}{2}}$$

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