Complex Number Review

1) If $z = \frac{2-j}{3+2j}$, compute the **magnitude** of z, $|z|$

2) If $z = \frac{1}{1+j}$, compute the **phase** of z, $\angle z$

3) If $z = \frac{1+j}{1-j}$, compute the **phase** of z, $\angle z$

4) If $z = \frac{2-j}{3+2j}$, compute the **complex conjugate** of z, z^*

5) If $z = \frac{1}{1+j\omega}e^{j\theta}$, compute the **complex conjugate** of z, z^*

6) If $z = \frac{1}{1+j\omega}e^{j\theta}$, compute the **magnitude** of z, $|z|$

7) We can write $e^{jk\pi}$ as a) 1 b) $(-1)^k$ c) 0

8) We can write j in polar form as a) $e^{j\pi}$ b) $e^{-j\pi}$ c) $e^{j\frac{\pi}{2}}$ d) $e^{-j\frac{\pi}{2}}$

9) We can write -1 in polar form as a) $e^{j\pi}$ b) $e^{-j\pi}$ c) $e^{j\frac{\pi}{2}}$ d) $e^{-j\frac{\pi}{2}}$

Phasor Review

Assume $x_1(t) = 10\cos(5t + 45^o)$ and $x_2(t) = 5\sin(5t + 45^o)$. Express these in phasor notation, and then express the following as a single sinusoid:

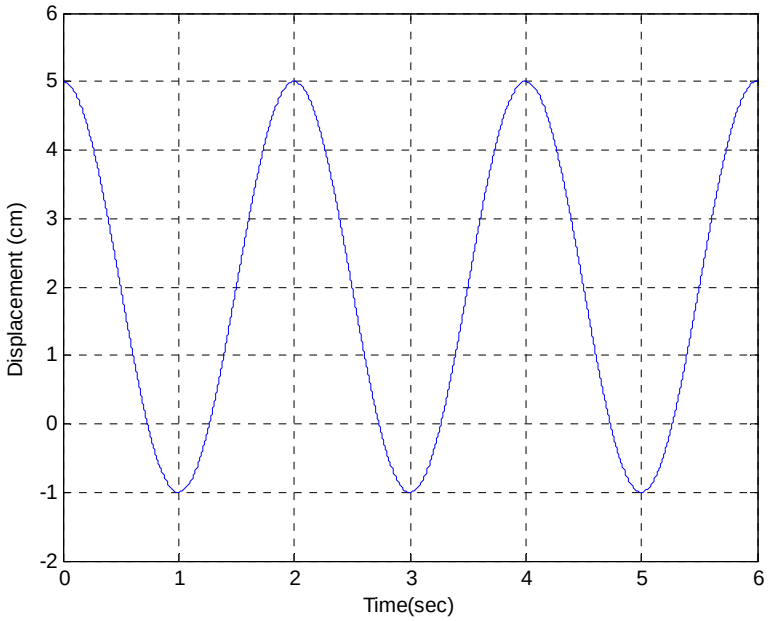
10) $y(t) = x_1(t)x_2(t)$

11) $y(t) = \frac{x_1(t)}{x_2(t)}$

Sines and Cosines Review

Problems 12-14 refer to the signal shown below, which we want to model as

$x(t) = A + B\cos(\omega t)$.



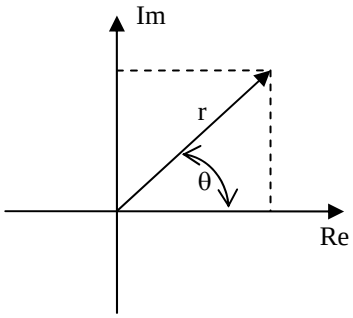
12) What is A? (your answer should be an integer)

13) What is B? (your answer should be an integer)

14) What is ω?

Euler's Identity Review

The following series of questions refer to the diagram below.



15) Given a vector in the complex plane expressed as a magnitude, r, and angle, θ, which statement best expresses the real and imaginary components of this vector?

a) $r\sin(\theta)+jr\sin(\theta)$ b) $r\cos(\theta)+jr\sin(\theta)$
c) $r\cos(\theta)+jr\cos(\theta)$ d) $r\sin(\theta)+jr\cos(\theta)$

16) If this vector is given by the function $z(t)=5e^{j\frac{\pi}{4}t}$, what is the angle, θ, of the vector when t=4 seconds?

a) 90 degrees b) 45 degrees c) -90 degrees d) 180 degrees e) none of these

17) If this vector is given by the function $z(t)=5e^{j\frac{\pi}{4}t}$, what is the angle, θ, of the vector when t=0 seconds?

a) π radians b) 2π radians c) $-\frac{\pi}{2}$ radians d) $\frac{\pi}{2}$ radians e) none of these

18) If this vector is given by the function $z(t)=5e^{j\frac{\pi}{4}t}$, what is the magnitude, r, of the vector when t=0 seconds?

a) 1 b) 5 c) 0 d) $\frac{\pi}{4}$ e) none of these

19) If you add two vectors (r,θ) + (r,-θ), the sum is:

a)purely real b) purely imaginary c) has both real and imaginary components
d) not enough information

20) If you subtract two vectors (r,θ) - (r,-θ), the difference is:

a)purely real b) purely imaginary c) has both real and imaginary components
d) not enough information

Answers:

1) $\frac{\sqrt{5}}{\sqrt{13}}$ 2) -45^o 3) $+90^o$ 4) $z^* = \frac{2+j}{3-2j}$ 5) $z = \frac{1}{1-j\omega}e^{-j\theta}$ 6) $|z| = \frac{1}{\sqrt{1+\omega^2}}$

7) b $(-1)^k$ 8) $e^{j\frac{\pi}{2}}$ 9) $e^{j\pi}$ or $e^{-j\pi}$ 10) $Y = 50\angle 0^o$, $y(t) = 50\cos(5t)$

11) $Y = 2\angle 90^o$, $y(t) = 2\cos(5t + 90^o)$ 12) $A = 2$ 13) $B = 3$ 14) $\omega = \pi$

15) $r\cos(\theta) + jr\sin(\theta)$ 16) 180 degrees 17) 0 or 2π radians 18) 5

19) purely real 20) purely imaginary