Test ID: TESTID Name: _____

MAT 320 **Quiz 2** Fall 2018

1. Rotate the complex number $-\frac{1}{2} + \frac{\sqrt{3}}{2}i$ by $\pi/3$ radians counterclockwise.

   a) $1 - i$ b) 1 c) -1 d) $-i$ e) i

   Correct Answer: -1

2. Write $2\cos 3t$ as an exponential sum:

   a) $2e^{i3t} + 2e^{-i3t}$ b) $e^{i3t} - e^{-i3t}$ c) $e^{i3t} + e^{-i3t}$ d) $2e^{i3t} - 2e^{-i3t}$ e) $ie^{i3t} - ie^{-i3t}$

   Correct Answer: $e^{i3t} + e^{-i3t}$

3. Suppose that for some filter, the input phasor $e^{i\omega_0 t}$ has output phasor $H(\omega_0)\cdot e^{i\omega_0 t}$, where $H(\omega_0) = \sin(\frac{\pi}{4})e^{i\omega_0/3}$. What is the *magnitude response* $|H(\omega_0)|$ given in dB?

   a) -2 b) -3 c) -1.5 d) 1.5 e) 2

   Correct Answer: -3

4. Let $f(t) = \frac{4}{\pi}\left[\sin(\omega_0 t) + \frac{1}{3}\sin(3\omega_0 t) + \frac{1}{5}\sin(5\omega_0 t) + \cdots\right]$, with $\omega_0 = 1400\pi$. The n^{th} harmonic of f is defined to be the term with angular frequency $n\omega_0$, or frequency $700n$ Hz. What is the smallest positive frequency which is an alias of the 100^{th} harmonic, if f is sampled at rate $40,000$ samples per second?

   a) 20 kHz b) 10 kHz c) 30 kHz d) 25 kHz e) 15 kHz

   Correct Answer: 10 kHz

5. If we change the period of f to be $T = \frac{1}{400}$ of a second, and change ω_0 accordingly, but keep the same sample rate, what is the period of the sampled wave form measured in samples?

   a) 200 b) 100 c) 300 d) 250 e) 150

   Correct Answer: 100