Test ID: TESTID Name: _____

MAT 320 **Quiz 2** Fall 2020

1. Rotate the complex number $-\frac{1}{2}+\frac{\sqrt{3}}{2}i$ by $\pi/3$ radians counterclockwise.
   a) $1-i$ b) 1 c) $-i$ d) -1 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. Factor the expression: $y_t = e^{i\frac{\pi}{4}t}+3e^{i\frac{\pi}{4}(t-\frac{1}{2})}$ One of the factors is:
   a) $1+3e^{-i\frac{\pi}{8}}$ b) $3+e^{-i\frac{\pi}{4}}$ c) $1+e^{-i\frac{\pi}{4}}$ d) $3+e^{-i\frac{\pi}{6}}$ e) $1+3e^{-i\frac{\pi}{4}}$
   Correct Answer: $1+3e^{-i\frac{\pi}{8}}$

4. What is the dynamic range of a signal that starts at volume V, then goes as quiet as $\frac{1}{8}V$ and then as loud as $4V$? Express the dynamic range in dB.
   a) 24dB b) 36dB c) 18dB d) 12dB e) 30dB
   Correct Answer: 30dB

5. What is the frequency of the phasor $e^{i\frac{\pi}{4}t}$ in Hz if t is measured in seconds?
   a) $\frac{1}{4}$ b) $\frac{1}{8}$ c) 4 d) 2 e) 8
   Correct Answer: $\frac{1}{8}$

6. Suppose that f_1 is the phasor $e^{i\frac{\pi}{4}t}$ and f_2 is the same phasor delayed by 1 second. What is the sum of these two phasors when $t=1$?
   a) $1+\frac{\sqrt{2}}{2}i$ b) $\frac{\sqrt{2}}{2}+\frac{\sqrt{2}}{2}i$ c) $1+\frac{\sqrt{2}}{2}$ d) $1+\frac{\sqrt{2}}{2}+\frac{\sqrt{2}}{2}i$ e) $\frac{\sqrt{2}}{2}i$
   Correct Answer: $1+\frac{\sqrt{2}}{2}+\frac{\sqrt{2}}{2}i$

7. The expression $\sqrt{1+a^2+2a\cos(bx)}$ with a and b positive real constants has minimum value for which x?
   a) $\frac{\pi}{a}$ b) $\frac{\pi}{b}$ c) $a\frac{\pi}{b}$ d) $b\frac{\pi}{a}$ e) $a\pi+b$
   Correct Answer: $\frac{\pi}{b}$

8. 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) -1.5 c) 1.5 d) 2 e) -3
   Correct Answer: -3