MAT 320 Quiz 1 Fall 2023

Quiz ID: WHK Name: _____

Answers:

1. ☐
2. ☐
3. ☐
4. ☐
5. ☐
6. ☐
7. ☐
8. ☐
9. ☐
10. ☐

Submit electronic answers at

http://azrael.digipen.edu/cgi-bin/MAT320quiz.pl

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1. Factor the polynomial $p(x) = x^3 + 1$ into linear and quadratic factors. The quadratic factor is:

   a) $x^2 + x + 1$ b) $x^2 - x + 1$ c) $x^2 + 1$ d) $x^2 - x - 1$ e) $x^2 + x - 1$

2. Same polynomial $p(x)$ as in the previous question. Use the quadratic formula to find the two complex roots of the quadratic factor. One of them is:

   a) $\frac{1}{4} - \frac{\sqrt{3}}{4}i$ b) $1 + \sqrt{3}i$ c) $\frac{1}{4} + \frac{\sqrt{3}}{4}i$ d) $\frac{1}{2} - \frac{\sqrt{3}}{2}i$ e) $-\frac{1}{2} - \frac{\sqrt{3}}{2}i$

3. Let $q(x) = (x - (a + bi))(x - (a - bi))$ be a quadratic polynomial in factored form. Multiply out so that $q(x) = x^2 + c_1 x + c_0$. What is c_1?

   a) $a + bi$ b) $a^2 + b^2$ c) $2a + 2bi$ d) $-2a$ e) $-2bi$

4. Same polynomial $q(x)$ as in the previous question. What is c_0?

   a) $a + bi$ b) $a^2 + b^2$ c) $2a + 2bi$ d) $-2a$ e) $-2bi$

5. Let $f(t) = e^{i4\pi t}$ be a phasor defined for all real numbers t, where t represents time in seconds. What is the frequency of this phasor measured in Hz (cycles per second).

   a) 4 b) $\frac{1}{2}$ c) 4π d) 2 e) 2π

6. Same $f(t)$ as in the previous question. What is the (smallest positive) period of f?

   a) 4 b) $\frac{1}{2}$ c) 4π d) 2 e) 2π

7. Let $f_c(z)$ be a complex function $f : \mathbb{C} \to \mathbb{C}$ which multiples the input complex variable z by the constant complex number $c = a + bi$. Assume f rotates z by an angle 120 degrees, or $\frac{2}{3}\pi$ radians, counterclockwise, and use this to solve for c. What is the real part a?

   a) $\frac{1}{2}$ b) -1 c) 1 d) 2 e) $-\frac{1}{2}$

8. Same $f_c(z)$ as in the previous question. Find the Cartesian form for $f(e^{i\pi/3})$.

   a) $\frac{1}{2} + \frac{\sqrt{3}}{2}i$ b) -1 c) 1 d) $-\frac{1}{2} + \frac{\sqrt{3}}{2}i$ e) $-\frac{1}{2} - \frac{\sqrt{3}}{2}i$

9. Let $g(z) = \frac{1}{|z|}$ so that $g : \mathbb{C} \to \mathbb{R}$. Find $g(1 + i)$.

   a) $\frac{1}{2}$ b) 1 c) $\sqrt{2}$ d) $\frac{\sqrt{2}}{2}$ e) $\frac{3}{2}$

10. Same $g(z)$ as in the previous question. Find the maximum value of $g(z)$ for inputs $z = x + yi$ where $y = x - 1$.

    a) $\frac{1}{2}$ b) 1 c) $\sqrt{2}$ d) $\frac{\sqrt{2}}{2}$ e) $\frac{3}{2}$