

MAT 320

Quiz 2

Fall 2024

1. Rotate the complex number $-\frac{1}{2} + \frac{\sqrt{3}}{2}i$ by $-\pi/6$ radians counterclockwise (or $\pi/6$ radians clockwise). What is the resulting complex number?

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

Correct Answer: i

2. Simplify: $e^{i3t} - e^{-i3t}$

a) $2 \cos(3t)$ b) $2i \sin(3t)$ c) $2 \cos(3t) + 2i \sin(3t)$ d) $\cos(3t) + i \sin(3t)$ e) 1

Correct Answer: $2i \sin(3t)$

3. Let $f(z) = z^2$ be a function with complex inputs and outputs. What is $f(e^{i\frac{\pi}{4}})$?

a) i b) 1 c) $e^{i\frac{\pi}{4}}$ d) $e^{i\frac{3\pi}{4}}$ e) $e^{i\frac{\pi}{8}}$

Correct Answer: i

4. Let $f(z) = z^3$ be a function with complex inputs and outputs. What is $f(e^{i\frac{\pi}{2}})$?

a) -1 b) $e^{-i\frac{\pi}{4}}$ c) $e^{i\frac{3\pi}{4}}$ d) $-i$ e) $e^{i\frac{\pi}{8}}$

Correct Answer: $-i$

5. Factor out from the expression an exponential function of t . $2e^{i\frac{\pi}{4}t} + e^{i\frac{\pi}{4}(t-2)}$ What is the remaining factor?

a) $1 - i$ b) $1 + 2i$ c) $1 + i$ d) $2 - i$ e) $1 + 2i$

Correct Answer: $2 - i$

6. How far does a point on the unit circle in the complex plane travel if its position is described by the function $f(t) = e^{i\frac{\pi}{4}t}$ and t goes from $t = 0$ to $t = 4$ and distance is measured as arc length along the unit circle (or radians).

a) π b) $\pi/4$ c) $\pi/2$ d) -1 e) 1

Correct Answer: π

7. Which of the following functions is periodic?

a) e^{it} b) t^2 c) $\frac{\pi}{4}t \sin(\frac{\pi}{4}t)$ d) $t - \pi$ e) $te^{i\frac{\pi}{4}}$

Correct Answer: e^{it}

8. The function $f(z) = \alpha z$ rotates its input by some angle, and also scales by a factor of $\sqrt{5}$ for which complex constant α ?

a) $-2 + i$ b) $1 - i$ c) $3 + 2i$ d) $\sqrt{5}(1 + i)$ e) $2 + 2i$

Correct Answer: $-2 + i$