Worksheet: The nth Roots of Unity

Q1: Which of the following is a general form for the roots $z^n = 1$ in exponential form?

A $e^{\frac{2\pi k}{n}i}$

B $e^{2\pi kni}$

C $e^{\pi kni}$

D $ne^{2\pi ki}$

E $e^{\frac{2\pi n}{k}i}$

Q2: Let ω be an nth root of unity. When can we define ω as a primitive nth root of unity?

A Only when n is a prime number

B When it is an mth root of unity for some $m < n$

C When it is an mth root of unity, where $\frac{m}{n}$ is a prime number

D When it is not an mth root of unity for some $m < n$

E Only when n is an even number

Q3: If ω is a primitive 6th root of unity, which of the following expressions is equivalent to $\omega + \omega^2 + \omega^3$?

A $-\left(1 + \omega^4 + \omega^5\right)$

B $\omega^4 + \omega^5 + \omega^6$

C $\frac{1}{2}\left(\omega^2 + \omega^4 + \omega^6\right)$

D $1 - \omega^4 - \omega^5$

E 1

Q4: Which of the following is one of the 8th roots of unity in Cartesian form?

A $\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}i$

B $\sqrt{2} - \sqrt{2}i$

C $-\frac{1}{2} - \frac{\sqrt{3}}{2}i$

D $\frac{\sqrt{3}}{2} - \frac{1}{2}i$

E $2\sqrt{2} + 2\sqrt{2}i$

Q5: Let ω be one of the quintic roots of unity. Which of the following is an equivalent expression to ω^{-3}?

A $\frac{1}{\omega^2}$

B $-\omega^3$

C ω^2

D ω^{-15}

E ω^8

Q6: Let ω be an nth root of unity and k be a positive integer. Which of the following is **not** an equivalent expression for ω^{-k}?

A $\left(\omega^k\right)^*$

B $\left(\omega^k\right)^{-1}$

C ω^{n+k}

D $\frac{1}{\omega^k}$

E ω^{n-k}

Q7: Let ω be an nth root of unity, where n is even. Which of the following expressions is equivalent to $-\omega^k$?

A $\omega^{k+\frac{n}{2}}$

B $\omega^{k+\frac{n}{4}}$

C $(\omega^{-k})^*$

D ω^{k+n}

E ω^{-k}