Universidad de Puerto Rico
Departamento de Matemáticas
MATE 3018 – Repaso 7–

Apellidos: _____ _____ Nombre _____
No. Estudiante: _____ Profesor:_____ Sección _____

(1) Let $z_1 = 3 - 4i,\ z_2 = 2 + 5i$. Find (write your answer in the form $a + bi$)):
   (a) $z_1 + z_2 =$

   (b) $\dfrac{z_1}{z_2} =$

   (c) $(z_1)^3 =$

   (d) $|z_1| =$

   (e) $i^{2009} + i^{2010} =$

(2) Divide $x^5 + 3x^3 - 4x^2 - 7$ by $x^2 - 3x$. Give the Quotient and the Remainder.

(3) Find k such that the Remainder of dividing $P(x) = 2x^5 + (k^2+1)x^4 - kx^3 + 2x^2 - 2x + 3$ by $x - 1$ is 7.

(4) Use the Factor Theorem to determine if $x + 3$ is a factor of $2x^5 + 5x^4 - 2x^3 + 2x^2 - 2x + 3$

(5) Find all possible rational roots of the polynomial equation $2x^5 + 5x^4 - 2x^3 + 2x^2 - 2x + 8 = 0$.

(6) Use synthetic division to find the Quotient and the Remainder in the division of $3x^4 + x^3 - 3x + 1$ by $3x + 1$.

(7) Prove that $\sqrt[3]{5}$ is not a rational number.

(8) Consider the polynomial $P(x) := 3x^4 + 5x^3 + 25x^2 + 45x - 18$.

(a) Show that $P(3i) = 0$.

(b) Find all roots of the equation $P(x) = 0$.

(c) Write $P(x)$ as a product of irreducible polynomials over $\mathbb{R}$.

(d) Write $P(x)$ as a product of irreducible polynomials over $\mathbb{C}$.

(9) Find a polynomial $P(x)$ of lowest degree having $1 - 2i$ and $1/3$ as roots of the equation $P(x) = 0$.

(10) Consider the polynomial $P(x) := x^4 - 9x^2 + 12x + 10$.

(a) Show that $P(2 - i) = 0$.

(b) Find all roots of the equation $P(x) = 0$.

(c) Write $P(x)$ as a product of irreducible polynomials over $\mathbb{R}$.

(d) Write $P(x)$ as a product of irreducible polynomials over $\mathbb{C}$.

(11) Find the coordinates of the points $P_{\frac{43\pi}{3}}$ and $P_{\frac{-25\pi}{6}}$

(12) Use the unit circle and the distance formula to prove that the coordinates of $P_{\frac{\pi}{6}} = \left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$.

(13) Find the coordinates of the points $P_{\frac{\pi}{6}}, P_{\frac{11\pi}{6}}, P_{\frac{13\pi}{6}}$. What is the relation between the coordinates of these points and the unit circle?

(14) Evaluate

(a) $\cos\left(\dfrac{-75\pi}{6}\right)=$

(b) $\sin\left(\dfrac{-75\pi}{6}\right)=$

(c) $\sin\left(\dfrac{-11\pi}{6}\right)=$

(15) If $\sin(x) = \dfrac{-2}{5}$ and $\pi \leq x \leq \dfrac{3\pi}{2}$, evaluate.

(a) $\cos(x) =$	(d) $\csc(x) =$
(b) $\cot(x) =$	(e) $\cos^2(x) - \sin^2(x) =$
(c) $\sec(x) =$	(f) $\tan(x) =$

(16) If $\tan(x) = \dfrac{5}{12}$ and x is in Quadrant III, evaluate.

(a) $\cos(x) =$	(d) $\csc(x) =$
(b) $\cot(x) =$	(e) $\sin(x) =$
(c) $\sec(x) =$	(f) $\cos^2(x) - \sin^2(x) =$

An angle α is placed in the standard position. Its terminal side passes through the point $P = (\sqrt{3}, \sqrt{2})$. Find:

(a) $\sin(\alpha) =$	(d) $\tan(\alpha) =$
(b) $\cos(\alpha) =$	(e) $\csc(\alpha) =$
(c) $\sec(\alpha)=$	(f) $\cot(\alpha) =$