Universidad de Puerto Rico
Departamento de Matemáticas
MATE 3018 – Exam III– November 28, 2007

Apellidos: _____ _____ Nombre _____

No. Estudiante: _____ Profesor: Warma   Sección OU1

(1) (**8 Pts**) Write each expression in the form $a + bi$.

    (a) $(3 + 4i)(1 - 2i)^2 =$

    (b) $i^{17}(i^{22} - 1) =$

    (c) $\dfrac{2 + 3i}{4 - i} =$

    (d) $\dfrac{4 + i}{i} =$

(2) (**6 Pts**) Use **synthetic division** to divide $P(x) = x^3 - 7x^2 + 5x + 3$ by $D(x) = x + 1$.

(3) (**6 Pts**) Find a polynomial equation of **lowest degree** that has $1 + i$ and $-1 + i$ as roots.

(4) (**6 Pts**) Given that $i\sqrt{3}$ is a zero of $P(x) = x^3 - 4x^2 + 3x - 12$, find the other roots of $P(x) = 0$.

(5) Consider the polynomial $P(x) = x^4 - 3x^3 - 5x^2 + 13x + 6$.

    (a) (**4 Pts**) Find **all possible rational roots** of the equation $P(x) = 0$.

    (b) (**4 Pts**) Find **a rational root** of the equation $P(x) = 0$.

(6) (**6 Pts**) Let $P(x) = 3x^4 + 5x^3 + 25x^2 + 45x - 18$. Verify that $P(3i) = 0$ and find all roots of $P(x) = 0$.

(7) (**4 Pts**) Determine the constant k so that $x + 2$ is a factor of $2x^3 + 3x^2 + kx + k + 1$.

(8) (**12 Pts**) Given that $\sin(t) = -\dfrac{12}{13}$ and $\dfrac{3\pi}{2} < t < 2\pi$, find the following.

(a) $\cos(t) =$	(e) $\csc(t) =$
(b) $\tan(t) =$	(f) $\sin(2t) =$
(c) $\cos(\frac{t}{2}) =$	(g) $\sin(\frac{t}{2}) =$
(d) $\cos(2t) =$	(h) $\cot(t) =$

(9) (**6 Pts**) Find the exact value of:

(a) $\sin(-\frac{7\pi}{4}) =$	(c) $\cos(\frac{123\pi}{4}) =$
(b) $\sin(-\frac{11\pi}{4}) =$	(d) $\cos(-\frac{12\pi}{4}) =$

(10) (**9 Pts**) An angle α is placed in the standard position. Its terminal side passes through the point $P = (-1, 2)$. Find:

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

(11) (**6 Pts**) Solve the following equations for $0 \le x < 2\pi$.

(a) $\sin(2x) = \sin(x)$

(b) $2\cos(x) = \sec(x)$

(12) (**4 Pts**) Evaluate.

(a) $\mathrm{Cos}^{-1}\left(-\dfrac{\sqrt{2}}{2}\right) =$

(b) $\mathrm{Sin}^{-1}\left(-\dfrac{\sqrt{3}}{2}\right) =$

(13) (**4 Pts**) Express **without using trigonometric or inverse trigonometric functions**.

(a) $\sin\left(\mathrm{Cos}^{-1}(x)\right) =$

(b) $\sin\left(2\mathrm{Sin}^{-1}(x)\right) =$

(14) (**4 Pts**) Simplify

(a) $\dfrac{\csc(x)}{\sin(x)} - \dfrac{\cot(x)}{\tan(x)} =$

(b) $\dfrac{\sec^2(x) - 1}{\sec^2(x)} =$

(15) Consider the function $f(x) = 2\sin(3x + \pi) + 1$.

(a) (**2 Pts**) Find the **amplitude**:

(b) (**2 Pts**) Find the **period**:

(c) (**2 Pts**) Find the **phase shift**:

(d) (**2 Pts**) Determine **the starting point of one cycle** of the graph:

(e) (**2 Pts**) Determine **the ending point of one cycle** of the graph:

(f) (**5 Pts**) Find the **five key points** to the graph of $y = 2\sin(3x + \pi)$

(g) (**6 Pts**) **Graph one cycle** of $y = 2\sin(3x + \pi)$ and $y = 2\sin(3x + \pi) + 1$.