

Universidad de Puerto Rico
Departamento de Matemáticas
MATE 3018 – Exam III– December 01, 2008

Apellidos: _____ Nombre _____
No. Estudiante: _____ Profesor: Warma Sección OU1

(1) (10 Pts) Write each expression in the form $a + bi$.

(a) $(15 - 2i)(2 + 3i)^3 =$

(b) $i^{47}(i^{26} - 1) =$

(c) $\frac{5 - i}{-4 + 5i} =$

(d) $\frac{5 + 3i}{i^{15}} =$

(e) $\frac{3 - 2i}{6 + 5i} \cdot \frac{4i}{2 + i} =$

(2) (4 Pts) Use **synthetic division** to divide $P(x) = x^3 + 2x^2 - 6x + 5$ by $D(x) = x + 4$.

(3) (**5 Pts**) Use **synthetic division** to divide $P(x) = 4x^4 + 2x^3 + 7x - 1$ by $D(x) = 2x - 3$.

(4) (**6 Pts**) Use **synthetic division** to divide $P(x) = x^3 + 2x^2 + 9x + 10$ by $D(x) = x - 3i$.

(5) (**6 Pts**) Find a polynomial equation of **lowest degree** and with integral coefficients that has $2 + i$ and $-3 - i$ as roots.

(6) (**6 Pts**) Given that $-2-i$ is a zero of $P(x) = x^4 + 4x^3 + 7x^2 + 8x + 10$, find the other roots of $P(x) = 0$.

(7) Consider the polynomial $P(x) = x^3 + 3x^2 + 4x + 12$.

(a) (**3 Pts**) Find **all possible rational roots** of the equation $P(x) = 0$.

(b) (**5 Pts**) Find **a rational root** of the equation $P(x) = 0$ and complete the solution if possible.

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(8) (**6 Pts**) Let $P(x) = 3x^4 + 5x^3 + 25x^2 + 45x - 18$. Verify that $P(-3i) = 0$ and find all roots of $P(x) = 0$.

(9) (**3 Pts**) Determine the constant k so that $x + 1$ is a factor of $x^3 + 3x^2 + kx + 3$.

(10) **(16 Pts)** Given that $\sec(t) = 3$ and $\frac{3\pi}{2} < t < 2\pi$, find the following.

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

(11) **(16 Pts)** Find the exact value of:

(a) $\sin\left(-\frac{9\pi}{4}\right) =$	(c) $\cos\left(\frac{225\pi}{4}\right) =$
(b) $\sin\left(-\frac{13\pi}{3}\right) =$	(d) $\cos\left(-\frac{16\pi}{3}\right) =$
(e) $\cos\left(\frac{\pi}{12}\right) =$	(f) $\sin\left(\frac{\pi}{12}\right) =$
(g) $\cos\left(\frac{-\pi}{8}\right) =$	(h) $\sin\left(\frac{-\pi}{8}\right) =$

- (12) (**12 Pts**) An angle α is placed in the standard position. Its terminal side passes through the point $P = (-2, \sqrt{5})$. Find:

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

- (13) (**6 Pts**). Simplify.

(a) $(\sin x + \cos x)^2 + (\sin x - \cos x)^2 =$

(b) $\frac{\sec(x) + \csc(x)}{1 + \tan(x)} =$

- (14) (**3 Pts**). Write as a sum or a difference:

$$\sin\left(\frac{\pi}{4} + x\right) \cdot \sin\left(\frac{\pi}{4} - x\right) =$$

- (15) (**3 Pts**). Express the sum as a product.

$$\cos(4x) + \cos(6x) =$$