Practice Quiz 5

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1. Do the following calculations and put the answer in the form $a + bi$.

a. $(11 - 4i) \cdot (2 + 5i) =$

b. $\dfrac{9 + 4i}{2 - 5i} =$

c. $\dfrac{1}{10 + 9i} + \dfrac{1}{10 - 9i} =$

2. Consider the equation $x^7 \left(x^2 - 25\right)^2 \left(x^2 + 25\right)^5 = 0$

a. How many roots does the equation have? (Count real, complex and multiple roots.)

b. Find all the roots of the equation (indicate multiplicites greater than one.)

3. Find a polynomial with integer coefficients (in standard polynomial form $a_n x^n + \cdots + a_1 x + a_0$) satisfying the following conditions.

a. P has degree three, and zeros 6 and $5 + 8i$

b. Q has degree four, with the complex zero $4 + i$ and a double zero at 2

4. Find the zeros of the following function $F(x) = x^4 + 4x^2 - 45$

ANSWERS: 1: *a)* $42 + 47i$, *b)* $-\frac{2}{29} + \frac{53i}{29}$, *c)* $\frac{20}{181}$, ; 2: a) 21, b) 0 multiplicity 7, ± 5 multiplicity 2, $\pm 5i$ multiplicity 5 ; 3: *a)* $x^3 - 16x^2 + 149x - 534$, *b)* $x^4 - 12x^3 + 53x^2 - 100x + 68$; 4: $\pm\sqrt{5}$, $\pm 3i$;

5. Do the following calculations and put the answer in the form $a + bi$.

a. $(4+5i)\cdot(2-5i) =$

b. $\dfrac{9+7i}{2+5i} =$

c. $\dfrac{1}{3+4i} + \dfrac{1}{3-4i} =$

6. Consider the equation $x^4\left(x^2-36\right)^4\left(x^2+36\right)^7 = 0$

a. How many roots does the equation have? (Count real, complex and multiple roots.)

b. Find all the roots of the equation (indicate multiplicites greater than one.)

7. Find a polynomial with integer coefficients (in standard polynomial form $a_n x^n + \cdots + a_1 x + a_0$) satisfying the following conditions.

a. P has degree three, and zeros 6 and $3+8i$

b. Q has degree four, with the complex zero $5-i$ and a double zero at 3

8. Find the zeros of the following function $F(x) = x^4 - x^2 - 20$

ANSWERS: 5: *a*) $33-10i$, *b*) $\frac{53}{29} - \frac{31i}{29}$, *c*) $\frac{6}{25}$, ; 6: a) 26, b) 0 multiplicity 4, ± 6 multiplicity 4, $\pm 6i$ multiplicity 7 ; 7: *a*) $x^3 - 12x^2 + 109x - 438$, *b*) $x^4 - 16x^3 + 95x^2 - 246x + 234$; 8: $\pm\sqrt{5}$, $\pm 2i$;