Practice Problems - Lecture 7

Problem 1. Identify each number as real, pure imaginary, or nonreal complex:
(a) $-7i$; (b) $-6-2i$; (c) $\sqrt{24}$; (d) $\sqrt{-36}$.

Problem 2. Multiply or divide:
(a) $\sqrt{-17}\cdot\sqrt{-17}$;
(b) $\sqrt{-5}\cdot\sqrt{-15}$;
(c) $\dfrac{\sqrt{-70}}{\sqrt{-7}}$;
(d) $\dfrac{20+\sqrt{-8}}{2}$.

Problem 3. Find the sum, difference, or product:
(a)$(4-i)+(8+5i)$;
(b) $(-2+4i)-(-4+2i)$;
(c) $(1+3i)(2-5i)$;
(d) $(2+i)^2$;
(e) $(2+7i)(2-7i)$.

Problem 4. Find the quotient and write in standard form:
(a) $\dfrac{6+2i}{1+2i}$;
(b) $\dfrac{2}{3i}$.

Problem 5. Simplify the powers of i:
(a) i^{54}; (b) i^{23}; (c) i^{-13}; (d) i^{40}.

Problem 6. Solve each quadratic equation:
(a) $x^2-2x+10=0$;
(b) $2x^2-4x+3=0$.

Problem 7. Evaluate the discriminant, and use it to predict the number of distinct solutions, and whether they are rational, irrational, or nonreal complex:
(a) $x^2+4x+4=0$;
(b) $8x^2=-14x-3$;
(c) $2x^2+4x+1=0$;
(d) $3x^2=4x-5$.

Answers:

1. (a) pure imaginary; (b) nonreal complex; (c) real; (d) pure imaginary.

2. (a) -17; (b) $-5\sqrt{3}$; (c) $\sqrt{10}$; (d) $10 + i\sqrt{2}$.

3. (a) $12 + 4i$; (b) $2 + 2i$; (c) $17 + i$; (d) $3 + 4i$; (e) 53.

4. (a) $2 - 2i$; (b) $-\dfrac{2}{3}i$.

5. (a) -1; (b) $-i$; (c) $-i$; (d) 1.

6. (a) $1 \pm 3i$; (b) $1 \pm \dfrac{\sqrt{2}}{2}i$.

7. (a) $D = 0$, one solution, rational; (b) $D = 100$, two solutions, rational; (c) $D = 8$, two solutions, irrational; (d) $D = -164$, two solutions, nonreal complex.