SEC. 5.1 COMPLEX NUMBERS

1. IMAGINARY NUMBER IS: $\sqrt{-1} = i$

$\sqrt{-1}^2 = i^2$

$-1 = i^2$

SO $\sqrt{-16}$

$\sqrt{-1} \cdot \sqrt{16}$

$i \cdot 4 = \boxed{4i}$

$\sqrt{-24}$

$\sqrt{-1} \cdot \sqrt{24}$

$i \cdot 2\sqrt{6} = \boxed{2i\sqrt{6}}$

2. COMPLEX NUMBER: $a + bi$

a: REAL #

bi: IMAGINARY PART

EX $-3 + 5i$

-3 REAL # AND 5 IS THE IMAGINARY PART

EX 5

5 IS THE REAL NUMBER AND 0 IS THE IMAGINARY PART

3. ADD / SUBTRACT COMPLEX NUMBERS:

ADD/SUB $(a+bi) \pm (c+di)$

$(a \pm c) + (bi \pm di)$

EX. $(5 - 2i) + (-8 + 4i) = \boxed{-3 + 2i}$

4. MULTIPLY COMPLEX NUMBER:

$(a+bi)(c+di)$ FOIL

$ac + adi + bci + bdi^2$ (-1)

EX. $(2-3i)(4+i)$

$8 + 2i - 12i - 3i^2$ (-1)

$8 + 2i - 12i + 3$

$11 - 10i$

5. CONJUGATES $(a+bi)(a-bi) = a^2+b^2$

$(5-3i)(5+3i)$

$25 + 15i - 15i - 9i^2$ (-1)

$25 + 9$

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6. DIVIDE COMPLEX NUMBERS:

$\left(\frac{6-5i}{2+3i}\right)\left(\frac{2-3i}{2-3i}\right)$ CONJUGATE

$\frac{12 - 18i - 10i + 15i^2}{4+9}$

$\frac{-3-28i}{13}$

$\frac{-3}{13} - \frac{28i}{13}$

7. POWERS OF i:

$i^1 = i$ $\quad$ $i^5 = i$ $\quad$ $i^9 = i$

$i^2 = -1$ $\quad$ $i^6 = -1$ $\quad$ $i^{10} = -1$

$i^3 = -i$ $\quad$ $i^7 = -i$ $\quad$ $i^{11} = -i$

$i^4 = 1$ $\quad$ $i^8 = 1$ $\quad$ $i^{12} = 1$

$i^{53} = i$ $\qquad$ $\frac{1}{i^{25}} \cdot \frac{i}{i}$ $\qquad$ $\frac{i}{i^{26}} = \frac{i}{-1} = -i$