ALGEBRA 2
PROBLEM SET 16

DUE DATE: NOVEMBER 7, 2023

Recall that we use the symbol $i = \sqrt{-1}$ with the understanding that $i^2 = -1$.

Question 1. Simplify each of the following in to $a + bi$ form.

(a) $(1+i)^2$

(b) $(2i-2)-(-1+i)$

(c) $(2+i)(3+i)$

(d) $\dfrac{2+i}{3-i}$

Question 2. Assuming that x and y are real numbers, solve for x and y in each equation:

(a) $x + yi = 3i - 4$ $\quad x=-4 \quad y=3$

(b) $x + yi = -7 + 2i$ $\quad x=-7, \; y=2$

(c) $x + yi = 0$ $\quad x=0 \quad y=0$

(d) $x + yi = (1-i)^2$ $\quad x=0, \; y=-2$

$(1-i)(1-i) = 1 - 1i - 1i + i^2$ ($i^2 = -1$)

$= 1 - 1 - 2i$

$= -2i$

(e) $(x+yi)^2 = 2i$

(f) $(x+yi)(2-i) = 8+i$

$\dfrac{(2-i)}{} \quad \dfrac{}{2-i}$

Question 3. Solve for all x that satisfy the equation (real or complex)

$x + yi = \dfrac{8+i}{2-i}\left(\dfrac{2+i}{2+i}\right) = \dfrac{(8+i)(2+i)}{2^2 - i^2}$

$= \frac{16-1}{5} + \frac{10}{5}i \Rightarrow \boxed{3+2i}$

(a) $x^2 - 10x + 29 = 0$

(b) $22x^2 + 5 = 6x$

(c) $x^2 + 14x + 50 = 0$

(d) $2x^2 + 9 = 0$

$(a+b)^2 = a^2 + 2ab + b^2$

$x = 2+i$

Question 4. Let $f(x) = 3x^2 + 2ix + i$. Compute $f(2+i)$

$3(2+i)^2 + 2i(2+i) + i$

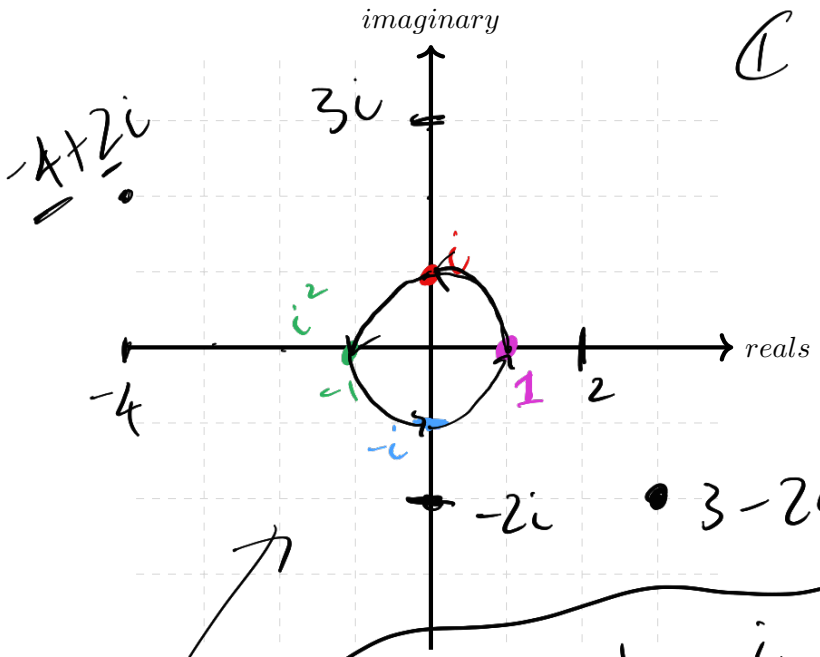
$\hookrightarrow 3(4+4i+i^2) + 4i + 2i^2 + i$

Question 5. Recall that $a^3 = aaa$. Using the fact that $i^2 = -1$, compute each of the following, and plot them on the complex plane (you should see a pattern!)

$\hookrightarrow 3(3+4i) + 5i - 2$

$9 + 12i + 5i - 2 = \boxed{7+17i}$

(a) 1
(b) i
(c) $i^2 = -1$
(d) $i^3 = i^2 \cdot i = -1 \cdot i = -i$
(e) i^4 $\hookrightarrow 1$ $\quad i^2 \cdot i^2$ or $-i \cdot i = -i^2 = 1$
(f) i^5 $\quad -1 \cdot -1 = 1$
(g) i^6
(h) i^7
(i) i^8



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$-4+2i$

$3-2i$

plot @ $(3,-2)$

$3-2i$

multiplication by i rotates plane by $90°$ counter clockwise


rotates