

Math 345 – Monday 11/20/17

Exercise 48. Write each of the following quantities in the form $a + bi$.

(a) $(3 - 2i) \cdot (1 + 4i)$

(b) $\frac{3 - 2i}{1 + 4i}$

(c) $\left(\frac{1 + i}{\sqrt{2}}\right)^2$

Exercise 49. Solve the equation $x^2 = 95 - 168i$ using complex numbers.

[Hint. First set $(u + vi)^2 = 95 - 168i$, then expand the left-hand side and solve for u and v .]

Exercise 50. For each part, check whether α divides β (in $\mathbb{Z}[i]$) and, if it does, find the quotient.

(a) $\alpha = 3 + 5i$ and $\beta = 11 - 8i$

(b) $\alpha = 2 - 3i$ and $\beta = 4 + 7i$

(c) $\alpha = 3 - 39i$ and $\beta = 3 - 5i$

Exercise 51.

(a) Show that $a + bi$ divides $c + di$ in $\mathbb{Z}[i]$ if and only if $a^2 + b^2$ divides both $ac + bd$ and $-ad + bc$ in \mathbb{Z} .

(b) Suppose that $a + bi$ divides $c + di$ in $\mathbb{Z}[i]$. Show that $a^2 + b^2$ divides $c^2 + d^2$.