MATH 1300 Problem Set: Complex Numbers

1 Nov. 2012

1. Evaluate the following, expressing your answer in Cartesian form $(a + bi)$:
   (a) $(1 + 2i)(4 - 6i)^2$
   (b) $(1 - 3i)^3$
   (c) $i(1 + 7i) - 3i(4 + 2i)$
2. Solve the following using the quadratic formula, and check your answers:
   (a) $z^2 + 2z + 2 = 0$
   (b) $z^2 - z + 1 = 0$
3. Evaluate the following, expressing your answer in Cartesian form $(a + bi)$:
   (a) $\dfrac{i}{1+i}$
   (b) $\dfrac{2}{(1-i)(3+i)}$
   (c) $\dfrac{1-2i}{3+4i} - \dfrac{2+i}{5i}$
   (d) $(1/i)^{2509}$
4. Solve the following systems of linear equations:
   (a) $\begin{cases} ix_1 - ix_2 = -2 \\ 2x_1 + x_2 = i \end{cases}$
   (b) $\begin{cases} x_1 + x_2 = 2 \\ x_1 - x_2 = 2i \end{cases}$
5. Evaluate the following by first converting to polar form $(Re^{i\theta})$. Express your answer in Cartesian form $(a + bi)$:
   (a) $(1 + i)^{12}$
   (b) $(i)^{1/3}$
6. Find every complex root of the following. Express your answer in Cartesian form $(a + bi)$:
   (a) $z^3 = i$
   (b) $z^3 = -27$