

MATH150 Introduction to odes, Fall 2010

Week 02 Worksheet: Complex numbers and separable odes

Name: _____

ID No.: _____

Tutorial Section: _____

To receive credit, the worksheet MUST be handed in at the end of the tutorial

(Partial solution of this worksheet will be available at the course website a week after all the tutorials)

1. **(Demonstration)** Model some complex number problems
2. **(Demonstration)** Model one separable ode equation
3. **(Class work)** Write as a complex number $z = x + iy$ where x and y are real:

(a) $\frac{1+3i}{3-2i}$: _____

(b) $\frac{1}{1+i} + \frac{1}{1-i}$: _____

(c) $\frac{-1-2i}{-4+3i}$: _____

(d) $-(7-i)(-4-2i)(2-i)$: _____

4. **(Class work)** Convert to polar form $z = r \exp(i\theta)$:

(a) $1 + \sqrt{3}i$: _____

(b) $(\sqrt{2} + \sqrt{2}i)^7$: _____

5. **(Class work)** Find all solutions of the following equations by writing $z = z \exp(n2\pi i)$, with n a natural number:

(a) $z^4 = 1$ _____

(b) $z^5 = 6i$: _____

(c) $z^5 = 1 + i$: _____

6. **(Class work)** Solve for x and y where x and y are real numbers

(a) $2y + ix = 4 + x - i$: _____

7. **(Class work)** Find the real part and the imaginary part of the following expression, where x is real:

(a) $\exp((5 + 12i)x)$: _____

8. **(Class work)** Solve the following differential equations by separating variables

(a) $y' = \frac{x^2}{y(1+x^3)}, \quad y(0) = y_0$: _____

(b) $y' = 2x/(y + x^2y)$, $y(0) = -2$: _____

(c) $y' = xy^3(1 + x^2)^{-1/2}$, $y(0) = 1$: _____

(d) $y' = 3x^2/(3y^2 - 4)$, $y(1) = 0$ (Leave as a cubic equation): _____

(e) $y' = (2 - e^x)/(3 + 2y)$, $y(0) = 0$: _____