COMS10013 - Analysis - WS6

Questions

These questions are partially taken from worksheets created by Conor Houghton and Chloe Martindale.

These are the questions you should make sure you work on in the workshop.

1. **Complex numbers**: calculate the following complex numbers in the form $(a + bi)$:
   (a) $(2 + 3i) + (5 - 2i)$
   (b) $(-1 + i)(-1 - i)$
   (c) $(1 - i)^3$
   (d) $(1 + i)/(1 - i)$
2. **More complex numbers**: Compute the real part, imaginary part, norm (i.e. absolute value), and conjugate of the following numbers:
   (a) i
   (b) $3 - 2i$
3. **Polar form**. Convert between rectangular $(a + ib)$ and polar $re^{i\theta}$ form:
   (a) i
   (b) $2 - i$
   (c) $3e^{i\pi/2}$
   (d) e^{1+2i}
4. **More on Polar form**.
   (a) What is the complex conjugate of $re^{i\theta}$ (expressed in polar form)?
   (b) What is the formula for the inverse of a complex number in polar form (e.g. $1/(re^{i\theta})$, give the solution in polar form again) and what does this mean geometrically?
5. **Second order equations** Solve the following equations for the given initial conditions

$$y''(t) = -y(t)$$

   with initial conditions $y(0) = 1$ and $y'(0) = 0$.

Extra questions

These are extra questions you might attempt in the workshop or at a later time.

1. **Equations with complex solutions**. Solve the following equations over the complex numbers
   (a) $x^2 - 2x + 5 = 0$
   (b) $x^2 - 2x + 8 = 0$
   (c) $x^2 - ix - 1 = 0$