

Worksheet 12, Math 1B

Complex Numbers and Nonhomogeneous Linear Equations

Monday, April 16, 2012

1. Solve the differential equation or initial value problem using the method of undetermined coefficients.

(a) $y'' + 3y' + 2y = x^2$

(b) $y'' + 9y = e^{3x}$

(c) $y'' - 4y = e^x \cos x$, $y(0) = 1$, $y'(0) = 2$

2. Find all solutions to the equation $x^4 = 1$.

3. Write a trial solution for the method of undetermined coefficients for the differential equation

$$y'' + 3y' - 4y = (x^3 + x)e^x$$

Do not determine the coefficients.

4. Use de Moivre's Theorem with $n = 3$ to express $\cos 3\theta$ and $\sin 3\theta$ in terms of $\cos \theta$ and $\sin \theta$.
5. Prove the following properties of complex numbers, where a line over a complex number indicates its complex conjugate.

(a) $\overline{z + w} = \bar{z} + \bar{w}$

(b) $\overline{z\bar{w}} = \bar{z}w$

(c) $\overline{z^n} = \bar{z}^n$