

**Exercise sheet 7 for Math 263: ODEs for Engineers** Matt Roberts  
*4th March 2012*

1. (a) Calculate  $-\frac{1}{2}(i-1)(i+1)$ .  
(b) What is  $(i-1)^{-1}$ ?
2. (a) Write down the annihilator of smallest order for
  - (i)  $x^2$ ;
  - (ii)  $x^3e^{-4x}$ ;
  - (iii)  $x^4\cos(-5x)$ .(b) If  $A(y) = D(y) - 1 - y^2$ , calculate  $A(\tan x)$ . Is  $A$  an annihilator for  $\tan x$ ?
3. Find the general solution to

$$y'' - 4y' + 7y = e^x \sin(2x),$$

- (a) by using the annihilator for  $e^x \sin(2x)$  directly;
- (b) by writing  $e^x \sin(2x) = \text{Im}(e^{(1+2i)x})$  and using the annihilator for  $e^{(1+2i)x}$ .

4. Find the general solution to

$$y'' + 3y' - 10y = \ln x.$$

(You may leave your particular solution in the form  $\int \cdots dx$ .)

If you spot any errors, please inform me: [matthew.roberts@mcgill.ca](mailto:matthew.roberts@mcgill.ca)