

**DIRECTIONS** To receive full credit, you must provide complete legible solutions to the following problems in the space provided. Transfer all your answers to the space provided.

1. Write the given differential equation in the form  $L(y) = g(x)$ , where  $L$  is a linear differential operator with constant coefficients. If possible, factor  $L$ . (Use  $D$  for the differential operator.)  
 $y'' - 6y' + 5y = 2x + 3$

2. Find a linear differential operator that annihilates the given function. (Use  $D$  for the differential operator.)

a.  $1 + 4x - 5x^3$

b.  $x + x^2 - 2\sin x$

c.  $e^{-x} + 9xe^x - x^2e^x$

d.  $8 + e^x \cos x$

3. Solve the given differential equation by undetermined coefficients.  
 $y''' + y'' = x^2$

4. Solve the given differential equation by undetermined coefficients.  
 $y'' + 2y' + y = x^2 e^{-x}$