

**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. The indicated function  $y_1(x)$  is a solution of the given differential equation. Use reduction of order directly to find a second solution  $y_2(x)$ .  
 $x^2 y'' - 3xy' + 5y = 0; \quad y_1 = x^2 \cos(\ln(x))$

2. The indicated function  $y_1(x)$  is a solution of the given differential equation. Use reduction of order or formula below to find the other solution  $y_2(x)$ .

$$y_2 = y_1(x) \int \frac{e^{-\int P(x) dx}}{[y_1(x)]^2} dx \quad x^2 y'' - xy' + 10y = 0; \quad y_1 = x \sin(3 \ln x)$$

3. The indicated function  $y_1(x)$  is a solution of the associated homogeneous equation. Use the method of reduction of order to find a second solution  $y_2(x)$  of the homogeneous equation and a particular solution  $y_p(x)$  of the given nonhomogeneous equation.

$$y'' - 3y' + 2y = 7e^{3x}; \quad y_1 = e^x$$