HW #2 (EngMath I)

Name: _____   Dept: _____   ID No: _____

1. (10 points) When $y_1(x)$ and $y_2(x)$ form a basis of solutions of the following equation:

$$y''(x) + p(x)y'(x) + q(x)y(x) = 0,$$

show that

$$y_p(x) = -y_1(x) \int \frac{y_2(x)r(x)}{W(x)} dx + y_2(x) \int \frac{y_1(x)r(x)}{W(x)} dx, \quad \text{with } W(x) = y_1(x)y_2'(x) - y_2(x)y_1'(x),$$

is a particular solution for the following nonhomogeneous linear ODE:

$$y''(x) + p(x)y'(x) + q(x)y(x) = r(x).$$

2. (23 points) Solve the following initial value problem:

$$x^3y''' - 2x^2y'' - 17xy' - 7y = 45x^2 \ln x - 24x^2, \quad (x > 0), \quad y(1) = 1, \; y'(1) = 0, \; y''(1) = 0.$$