Final Exam Practice Questions

1. Find the general solution for the following differential equation:
$x^2y' = xy + y^2$

2. $y'' + 16y' + 64y = 0$

(a) Give the characteristic polynomial for the differential equation. (use r as your variable.)

(b) List the roots of the characteristic polynomial for the differential equation.

(c) List the basic solutions for the differential equation, i.e. $y_1(t)$, $y_2(t)$.

3. Find two linearly independent solutions of $y'' + 1xy = 0$ of the form

$y_1 = 1 + a_3x^3 + a_6x^6 + \cdots$

$y_2 = x + b_4x^4 + b_7x^7 + \cdots$

Enter the first few coefficients:

$a_3 =$

$a_6 =$

$b_4 =$

$b_7 =$

4. Consider the initial value problem

$$y' + 2y = 12t, \qquad y(0) = 5.$$

a. Take the Laplace transform of both sides of the given differential equation to create the corresponding algebraic equation. Denote the Laplace transform of $y(t)$ by $Y(s)$. Do not move any terms from one side of the equation to the other (until you get to part (b) below).

$\square = \square$ help (formulas)

b. Solve your equation for $Y(s)$.

$Y(s) = \mathcal{L}\{y(t)\} = \square$

c. Take the inverse Laplace transform of both sides of the previous equation to solve for $y(t)$.

$y(t) = \square$

5.

Find the general solution for the following differential equation:

$y' - 2y = -3\frac{1}{y^4}$

General Solution: $y(t) =$ ☐