Your Name   Student ID #

In these problems, **check all that apply**.

1. Consider the differential equation

$$\frac{1}{2}y'' + y' + y = 1.$$

   This equation...

   $\checkmark$ **is linear** $\bigcirc$ is non-linear
   $\bigcirc$ is first order $\checkmark$ **is second order**
   $\bigcirc$ is homogeneous $\checkmark$ **is non-homogeneous**
   $\checkmark$ **has constant coefficients** $\bigcirc$ has non-constant coefficients
   $\bigcirc$ is an initial value problem

   The characteristic equation...

   $\bigcirc$ has distinct real roots $\bigcirc$ has repeated roots
   $\checkmark$ **has complex roots** $\bigcirc$ does not make sense

   The **general solution** to this equation can be found using...

   $\checkmark$ **reduction of order, with** $y_1 = $ ____$e^{1\pm i}$____

   $\checkmark$ **variation of parameters, with** $y_1 = $ ____$e^{1\pm i}$____, $y_2 = $ ____$e^{1\mp i}$____

   $\checkmark$ **undetermined coefficients, with** $Y = $ ___$A = Ae^{0t}$___

   $\bigcirc$ none of the above

2. Consider

$$y'' - \frac{2}{t^2}y = 0, \qquad y(1) = 1, y'(1) = 2, \qquad t > 0.$$

   This equation...

   $\checkmark$ **is linear** $\bigcirc$ is non-linear
   $\bigcirc$ is first order $\checkmark$ **is second order**
   $\bigcirc$ is homogeneous $\checkmark$ **is non-homogeneous**
   $\bigcirc$ has constant coefficients $\checkmark$ **has non-constant coefficients**
   $\checkmark$ **is an initial value problem**

   The characteristic equation...

   $\bigcirc$ has distinct real roots $\bigcirc$ has repeated roots
   $\bigcirc$ has complex roots $\checkmark$ **does not make sense**

   The solution to this problem can be found using...

   $\checkmark$ **reduction of order, with** $y_1 = t^2$

   $\bigcirc$ variation of parameters, with $y_1 = t^3$, $y_2 = t^4$

   $\checkmark$ **undetermined coefficients, with** $Y(t) = At^2$

   $\bigcirc$ none of the above