Math 321 CLASS EXERCISES, FEBRUARY 5TH **Winter 2018**

1. Give the solution to each of the following differential equations.

   (a) $y'' + 25y = 0$ (b) $y'' + 4y' + 4y = 0$

2. Consider the differential equation $x^2y'' + 2xy' - 6y = 0.$

   (a) For a reason you'll soon see, a good guess for a solution is $y = x^P$, where p is a constant. Plug that into the ODE and then factor out an x^p and simplify the remaining part.

   (b) You now have $x^p(stuff) = 0,$ which implies that either $x^p = 0$ or $stuff = 0.$ We don't want the first of these, so we solve $stuf f = 0$ to find $p.$

   (c) What are the solutions to the ODE?

3. (a) Solve the initial value problem (independent variable t)

$$5y'' + 6y' + 80y = 0, \qquad y(0) = 2,\ y'(0) = -6$$

Give your answer in the form $y = Ce^{at}\sin(\omega t + \phi)$ with all numbers in decimal form, rounded to the nearest tenth. (Note that 5.0007 rounded to the nearest tenth is 5.0, *not* 5! What is the difference?)

(b) Graph the solution to the IVP on your calculator. Adjust the viewing window to get about three cycles of the motion displayed fairly large. Sketch your graph.

(c) Graph $y = 2.3e^{-0.6t}$ and $y = -2.3e^{-0.6t}$ together with the solution you graphed in (b). Add them to your sketch *as dashed curves*.

4. Solve $y'' + 5y' + 4y = 0$.