YAPS: Yet Another Problem Set Diffeq 1

The following are questions/issues to help you to organize your thoughts. The answers are to be found by looking at the work we did in class.

**Section: Basic Diffeq**

1) Why do you need an initial condition to solve a diffeq?

2) What makes a diffeq separable?

**Section: Equilibria**

1) How do you find equilibria?

**Section: Integrating Factors**

1) What kinds of equations can use an integrating factor?

2) Integrating factors use two integrals. What are they?

3) In the integrals for integrating factors, which integrals uses a \( +C \) and which does not?

4) Since the integrating factor uses an exponential, you may have to simplify exponentials. How do each of these simplify?

\[ e^{-\ln(x)} \quad e^{2\ln(x)} \]

**Section: Second order Equations**

1) If you have a diffeq \( a\frac{d^2y}{dx^2} + b\frac{dy}{dx} + cy = 0 \), initial conditions \( y(0) = 0 \), \( y'(\frac{\pi}{2}) = 1 \), which of the two solutions would you use, and why?

\[ y = Ae^{(-2+3i)x} + Be^{(-2-3i)x} \quad y = Ce^{-2x} \sin(3x) + De^{-2x} \cos(3x) \]

2) If you have a diffeq \( a\frac{d^2y}{dx^2} + b\frac{dy}{dx} + cy = 0 \), initial conditions \( y(0) = 0 \), \( y'(0) = 1 \), which of the two solutions would you use, and why?

\[ y = Ae^{2x} + Be^{-2x} \quad y = C \cosh(2x) + D \sinh(2x) \]