Differential Equations Standards

Module C: How can we solve and apply linear constant coefficient ODEs?

☐ ☐ **C1. Constant coefficient first order.** I can find the general solution to a first order constant coefficient ODE.

☐ ☐ **C2. Modeling motion in viscous fluids.** I can model the motion of a falling object with linear drag

☐ ☐ **C3. Homogeneous constant coefficient second order.** I can find the general solution to a homogeneous second order constant coefficient ODE.

☐ ☐ **C4. IVPs.** I can solve initial value problems for constant coefficient ODEs

☐ ☐ **C5. Non-homogenous constant coefficient second order.** I can find the general solution to a non-homogeneous second order constant coefficient ODE

☐ ☐ **C6. Modeling oscillators.** I can model (free or forced, damped or undamped) mechanical oscillators with a second order ODE

Module F: How can we solve and apply first order ODEs?

☐ ☐ **F1. Sketching trajectories.** I can given a slope field, sketch a trajectory of a solution to a first order ODE

☐ ☐ **F2. Separable ODEs.** I can find the general solution to a separable first order ODE

☐ ☐ **F3. Autonomous ODEs.** I can find and classify the equillibria of an autonomous first order ODE, and describe the long term behavior of solutions

☐ ☐ **F4. First order linear ODEs.** I can find the general solution to a first order linear ODE

☐ ☐ **F5. Exact ODES.** I can find the general solution to an exact first order ODE

☐ ☐ **F6. Modeling motion.** I can model the motion of an object with quadratic drag

Module S: How can we solve and apply systems of linear ODEs?

☐ ☐ **S1. Solving systems.** I can solve systems of constant coefficient ODEs

☐ ☐ **S2. Modeling interacting populations.** I can model the populations of two interacting populations with a system of ODEs

☐ ☐ **S3. Modeling coupled oscillators.** I can model systems of coupled mechanical oscillators using a system of ODEs

Module N: How can we use numerical approximation methods to apply and solve unsolvable ODEs?

☐ ☐ **N1. First Order Existence and Uniqueness.** I can determine when a unique solution exists for a first order ODE

☐ ☐ **N2. Second Order Linear Existence and Uniqueness.** I can determine when a unique solution exists for a second order linear ODE

☐ ☐ **N3. Systems Existence and Uniqueness.** I can determine when a unique solution exists for a system of first order ODEs

☐ ☐ **N4. Euler's method for first order ODES.** I can use Euler's method to find approximate solution to first order ODEs

☐ ☐ **N5. Euler's method for systems.** I can use Euler's method to find approximate solutions to systems of first order ODEs

Module D: How can we solve and apply ODEs involving functions that are not continuous?

☐ ☐ **D1. Laplace Transform.** I can compute the Laplace transform of a function

☐ ☐ **D2. Discontinuous ODEs.** I can solve initial value problems for ODEs with discontinuous coefficients

☐ ☐ **D3. Modeling non-smooth motion.** I can model the motion of an object undergoing discontinuous acceleration

☐ ☐ **D4. Modeling non-smooth oscillators.** I can model mechanical oscillators undergoing discontinuous acceleration