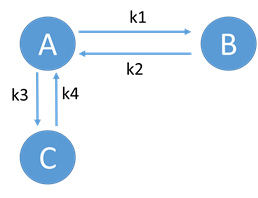
Create a livescript and include both the questions below as text and your answers as equation input blocks. **Submit both the livescript and (File->Export) PDF file. 5 points each for 1-12.**

1. Evaluate the following limits if they exist:
2. Find the derivatives of the following functions:
3. Evaluate the following definite integrals:
4. Graph the following:
   1. for
   2. for
5. Show the following differential equations:
   1. given that y(1)=1. Plot y for
   2. given that y(2)=3. Plot y for 0
   3. given that x(0)=1 and Plot x for 0
6. Compute the fifth derivative of See documentation for diff().
7. Compute an expanded form of the expression
8. Generate a plot of the function for
9. Find a simplified expression for the following sum:
10. Compute , , and for the following matrices:
11. Find all solutions to the following system of linear equations
12. Compute the following integral
13. 20 points. A certain metabolite A in a cell is converted to B and C at rates of k1=0.5 min-1 and k3=0.3 min-1, respectively. The reverse reactions occur at rates of k2=0.2 min-1 and k4=0.1 min-1, respectively. Initially, the concentrations of A, B, and C are 700 nM, 500 nM, and 0 nM

respectively.



* 1. Solve the system of ODEs for the concentrations of these metabolites. Plot their concentrations over time.
  2. At what time are the concentrations of the A and B equal?
  3. What are the steady-state concentrations of these metabolites?

1. 20 points. The differential equation

is the governing equation for a “forced harmonic oscillator”. It describes the behavior of an energy conserving system that vibrates freely at frequency A (radians/sec), and which is excited by an external force at frequency B. Use symbolic math to solve the equation with initial conditions x=0 and dx/dt=0 (simplify the solution, and use IgnoreSpecialCases). Plot the solution for a time interval of 60 sec, with A=1, B=1.2.