ENGR 222 Dynamics
Problem Set #1

Mariam and Kraige, Engineering Mechanics-Dynamics (Eighth Edition)
Material Covered: Chapter 1, Appendix C

Topics Covered:

Vectors	Cross products
Scalar products	Differential Equations

1. For the vectors $\vec{A}$ and $\vec{B}$ if $\vec{A} = 5\hat{\imath} + 2\hat{\jmath} - 6\hat{k}$ and $\vec{B} = 3\hat{\imath} - \hat{\jmath} + 4\hat{k}$,
   a) find the direction cosines of each vector.
   b) find the scalar product.
   c) find the angle between the two vectors
      i) using the scalar product.
      ii) using the direction cosines
   d) find the cross product using
      i) direct multiplication.
      ii) a determinant.

2. Consider the differential equation

$$\frac{dz}{dx} + 5z = sin\, x.$$

   a) Solve for the initial condition $z(0) = 12$ using the integrating factor technique.
   b) Check your answer.

3. Solve the following differential equation for the initial conditions $y(0) = 0$ and $y(3) = 1$.

$$3\frac{d^2y}{dt^2} - 12\frac{dy}{dt} + 6y = t^2 \sin 5t.$$