Physics 321 – Spring 2017

Homework #1 Due at beginning of class Wednesday Jan 18.

1. [3 pts] Given the vectors $\mathbf{a} = (1, 2, 4)$ and $\mathbf{b} = (2, 4, 1)$
   (a) Find the scalar $\mathbf{a} \cdot \mathbf{b}$.
   (b) Use dot products to find the angle between the vectors $\mathbf{a}$ and $\mathbf{b}$. Give your answer in degrees.
   (c) Find the vector $\mathbf{a} \times \mathbf{b}$.

2. [4 pts]
   (a) Express $(1 - \cos x)/x^2$ for small x as a power series in x, keeping terms up through order x^4 .
   (b) Express $\sin(\pi/3 + x)$ for small x as a power series in x, keeping terms up through order x^5 .

3. [8 pts]
   (a) Solve the differential equation $\frac{dF}{dt} = 2$ for $F(t)$ subject to the condition $F(0) = F_0$, where F_0 is a constant.
   (b) Solve the differential equation $\frac{dF}{dt} = 2t$ for $F(t)$ subject to the condition $F(0) = F_0$, where F_0 is a constant.
   (c) Solve the differential equation $\frac{dF}{dt} = 2F$ for $F(t)$ subject to the condition $F(0) = F_0$, where F_0 is a constant.
   (d) Solve the differential equation $\frac{dF}{dt} = 2\,F\,t$ for $F(t)$ subject to the condition $F(0) = F_0$, where F_0 is a constant.

4. [5 pts] Taylor problem 1.37

(Last updated 1/9/2017.)