Mathematica Assignment #01 Due 5pm Friday, Sep. 25

This assignment is intended to help you visualize parametric curves. As an example, to draw the circle of radius 2 centered at (4,3) with viewing window [-1,8] by [-1,6] you may enter:

```
x[t_] := 4 + 2 Cos[t]
y[t_] := 3 + 2 Sin[t]
ParametricPlot[{x[t], y[t]}, {t, 0, 2 Pi}, PlotRange -> {{-1, 8}, {-1, 6}}]
```

For your assignment, create a *Mathematica* notebook in which you draw the 3-dimensional (space) curves specified below. Instead of the ParametricPlot[] command you will want to use ParametricPlot3D[]. (You can get help on these commands by entering in a notebook cell ?ParametricPlot.) Often it'll be OK to use the default viewing window, so ignore the PlotRange option. Upload to the Digital Dropbox (in Knightvision) a .pdf copy of your Mathematica notebook. (Please also save a copy for yourself – perhaps by emailing a copy to yourself.) *Each time, be sure to rotate your plots so that you can see what's going on!*

1. Draw the parameterized curve $\langle x(t), y(t), z(t)\rangle = \langle t\cos t, t\sin t, t\rangle$ for $-10\pi \le t \le 10\pi$. Verify by hand that the curve lies on the cone $x^2 + y^2 = z^2$.

2. Draw the parameterized curve $\langle x(t), y(t), z(t)\rangle = \langle \sin t, \cos t, \sin^2 t\rangle$ for $0 \le t \le 2\pi$. Verify by hand that this curve is the intersection of the paraboloid $z = x^2$ and the cylinder $x^2 + y^2 = 1$.
   (By rotating the plot, hopefully you can visualize the paraboloid and cylinder!)

3. Draw the curve that has parametric equations for $0 \le t \le 2\pi$,

   $$x(t) = \sqrt{1 - .25\cos^2 20t}\ \cos t$$
   $$y(t) = \sqrt{1 - .25\cos^2 20t}\ \sin t$$
   $$z(t) = .5\ \cos 20t.$$

   Verify that the curve lies on the sphere with radius 1 and center (0,0,0).