Calc 3 - Maple 1

In class we discussed several Maple commands to visualize functions of two variables, sheets, implicitly defined functions, and vector-valued functions:

with(plots)	Loads additional plot commands
plot3d(f(x,y), x=A..B, y=C..D) $plot3d(\sin(x)\cdot\cos(y), x=-4..4, y=-4..4)$	Draws a surface in 3D
implicitplot3d(f(x,y,z)=c, x=A..B, y=C..D, z=E..F) $implicitplot3d(x^2+y^2+z^2=1, x=-1..1, y=-1..1, z=-1..1)$	Draws an implicitly defined function
plot([x(t), y(t), t=A..B], x=C..D, y=E..F) $plot([\sin(t), \cos(t), t=-4..4], x=-1..1, y=-1..1)$	Draws a 2D space curve
spacecurve([x(t),y(t),z(t)], t=A..B) $spacecurve([\cos(t), \sin(t), t], t=0..8\cdot\mathrm{Pi}, numpoints=500)$	Draws a 3D space curve
tubeplot([x(t), y(t), z(t)], t=A..B) $tubeplot([t, t^2, t^3], t=-1..1)$	Draws a tube around a 3D space curve

Complete the following assignments in Maple. Save your Maple worksheet or copy-and-paste your graphs into a Word document. Submit the document as an email attachment to me.

1. Use the appropriate plot command to visualize the following functions:
   a) $f(x,y) = x\,e^{-x^2-y^2}$
   b) $x^2+z^2=4$
   c) $r(t) =< \cos(t), \sin(2t) >$
   d) $x^3+y^3+z^3+1=(x+y+z+1)^3$
   e) $r(t) =< 2\cos(5t), 5\sin(7t) >$
   f) $f(x,y) = \sin(x\,y)$
   g) $r(t) =< -10\cos(t) - 2\cos(5t) + 15\sin(2t), -15\cos(2t) + 10\sin(t) - 2\sin(5t), 10\cos(3t) >$
   h) $\sin(x)\cdot\cos(y)\cdot z = 0.5$
   i) $r(t) =< \cos(t), \sin(t), \cos(t)\cdot\sin(t) >$

   Right-click on your plot to add axes to your picture and rotate it so that the primary features of the graph show up nicely.

2. As a late Valentine's Day special, draw the 2D space curve

$$r(t) =< \sin(t)\cdot\cos(t)\cdot\ln(|t|), |t|^{0.3}\cdot(\cos(t))^{\frac{1}{2}} >$$

   as *t* goes from -1 to 1.

Bonus: To see what else Maple can do, execute the following command. Do you know the name of the object?

$$plot3d\left(\left[4+x\cos\left(\frac{1}{2}y\right), y, x\sin\left(\frac{1}{2}y\right)\right], x=-\pi..\pi, y=0..2\pi,$$
$$coords=cylindrical, style=patchnogrid, grid=[60,60],$$
$$orientation=[35,135], lightmodel=light4, shading=zhue,$$
$$scaling=constrained, transparency=0.3\right)$$