APPM 2450 Calculus 3 Computer Lab
Lab Exercise 4

Create a Mathematica notebook that does all of the following. Feel free to ask your neighbor or your lab instructor for help if you get stuck. Items with a ➠ are required, items with a ☆ are optional.

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➠ Type `Options[Plot3D]` to see a list of all the available options for `Plot3D`. Note this works for all functions in Mathematica.

Carefully define the following functions,

$$\begin{aligned} f(x,y) &= \cos(x)\cos(y)e^{\frac{-\sqrt{(x^2+y^2)}}{4}} \\ g(x,y) &= 3(1-x)^2e^{-x^2-(y+1)^2} - 10(x/5 - x^3 - y^5)e^{-x^2-y^2} - 1/3e^{-(x+1)^2-y^2} \\ h(x,y) &= \frac{2x^2y}{x^4+y^2}. \end{aligned}$$

Remember that $e^x$ is entered as `Exp[x]`, and remember to use parentheses where needed!

➠ Make a 3D plot of $f(x,y)$ for $-2\pi \le x \le 2\pi$, $-2\pi \le y \le 2\pi$. Then, using options like `PlotRange`, `PlotPoitns`, "`Mesh`, and `AxesLabel`, make the plot look as nice as you can.

➠ Use the option `ViewPoint->{2,0,0.5}` to view the plot as if you were standing in the positive x-direction, and slightly in the air (z-direction), looking at the origin.

➠ Play with `ViewPoint{}` or the ViewPoint Selector (In the menu bar, Input `->` 3D ViewPoint Selector) and find an angle that looks nice.

➠ Run the command `<<RealTime3D‘`, then Copy-and-paste your `Plot3D` command from before you used `ViewPoint`. Run your just-pasted plot command. Now, you can rotate the plot by hand! (Note: the ‘ is the single left quote that is on the top-left of your keyboard.)

➠ Run the command `<<Default3D‘` to return to the original style of plotting.

➠ Make a `ContourPlot` for $f(x,y)$. Using the options `Contours`, `ContourLines`, and `PlotPoints` as you see fit, make the contour plot as nice as you can

➠ Remember that a `ContourPlot` has a frame, not axes. As such, use `FrameLabel->{...}` to label the axes. See today's demo for details.

➠ Do all of the above for $g(x,y)$ for $-2.5 \le x \le 2.5$, $-2.5 \le y \le 2.5$.

☆ Do all of the above for $h(x,y)$ for $-3 \le x \le 3$, $-3 \le y \le 3$.

➠ ⋆**Important**⋆: Go to 'Kernel', then 'Delete All Output' before you save!
This will delete your plots, but leave your commands, thus greatly reducing the size of the file. (As an example: with the plots the demo notebook from today was 8 MB, without the plots it was 11 KB).
Save your notebook as *YourLastName4.nb* and email as an attachment to your instructor.