Math 242 **Midterm 4 Review**

1. For each of the following integrals, draw a picture of the region in $\mathbb{R}^2$ being integrated over.

   (a) $\displaystyle\int_{-2}^{0}\int_{0}^{\sqrt{4-x^2}} f(x,y)\,dydx.$

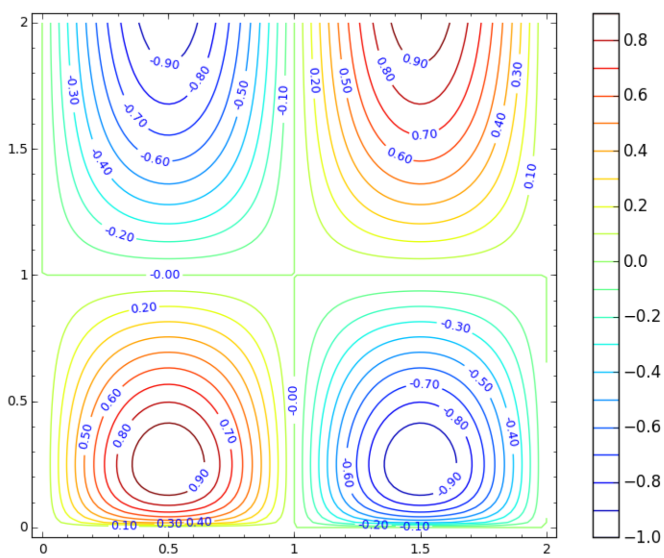
   (b) $\displaystyle\int_{\pi/4}^{3\pi/4}\int_{-1}^{1} g(r,\theta)\,rdrd\theta$

   (c) $\displaystyle\int_{0}^{1}\int_{2x}^{2} h(x,y)\,dydx.$

2. Reverse the order of the integrals to compute $\displaystyle\int_{0}^{1}\int_{2x}^{2} e^{y^2}\,dydx.$ Hint: you will need to change the bounds if you integrate with respect to x first.

3. Find the volume of the solid whose base is the region in the xy-plane that is bounded by the parabola $y = 4 - x^2$ and the line $y = 3x$, while the top of the solid is bounded by the plane $z = x + 4$.

4. Use a Riemann sum of the form $\sum\sum f(x_i^*, y_j^*)\Delta x\Delta y$ to estimate $\displaystyle\iint_R f(x,y)\,dxdy$ where $f(x,y) = \sin(\pi x)\sin(\pi\sqrt{y})$ is the function shown in the contour plot below and $R = [0,2]\times[0,2]$. Use 4 sub-rectangles for your estimate.



5. Evaluate $\displaystyle\iint_D y\,dA$ where D is the region between the circles $x^2 + y^2 = 1$ and $x^2 + y^2 = 4$ in the first quadrant.

6. Find the volume of the region between the planes $x = 0$, $y = 0$, $z = 0$, and $4x + 3y + 2z = 12$.