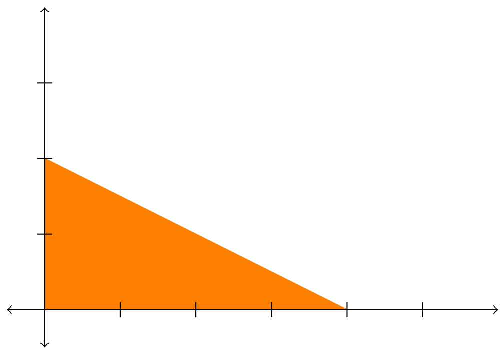
Exam 2 **Calc 3** **10/27/23**

Each problem is worth 10 points. For full credit provide good justification for your answers.

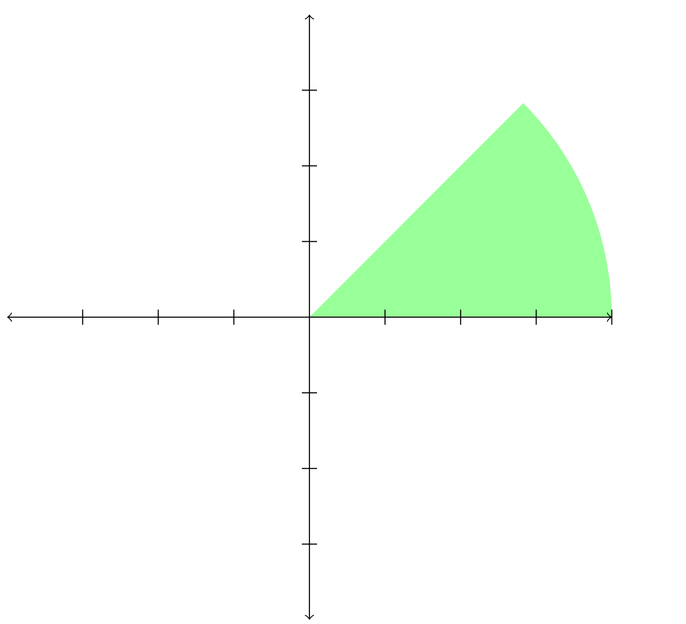
1. Write a double Riemann sum for $\iint_R f\, dA$, where $R = \{(x, y) : 2 \leq x \leq 6, 0 \leq y \leq 4\}$ using midpoints with $n = m = 2$ subdivisions

2. Set up a double integral for the integral from #1.

3. Set up limits of integration for finding the volume under $f(x,y) = 3 + y$ within the pumpkin-colored region shown:



4. Set up limits of integration for finding the volume under $g(x,y) = 10 - x$ within the ghostly green region shown:



5. Evaluate $\int_0^1 \int_{3y}^3 e^{x^2}\, dx\, dy$

6. Show that the Jacobian for the conversion from rectangular to polar coordinates is what it is.

7. Bunny is a calculus student at Enormous State University, and she's having some trouble. Bunny says "OMG! These spherical thingies are so hard! I tried to do, like, the online homework, right? And I put limits of 0 to 2π on everything with angles because this one guy who was working in the computer lab told me that's pretty much always right? And the theta ones it was right on a lot of them, but on the phi ones it wasn't right on *any* of them! Can you believe how unfair that is?"

   Help Bunny by explaining as clearly as you can why the responses she got make sense.

8. Set up integrals for the x coordinate of the center of mass of the first-octant portion of a sphere with radius 5 and uniform density.

9. Evaluate the integral $\displaystyle\int_0^1 \int_0^{\sqrt{1-x^2}} \int_{\sqrt{x^2+y^2}}^{\sqrt{2-x^2-y^2}} z\, dz\, dy\, dx.$

10. Set up an integral for the volume of the solid between $z = x^2 + y^2$ and $z = x + 2$.

Extra Credit (5 points possible): Evaluate $\displaystyle\int_{-\infty}^{\infty}\int_{-\infty}^{\infty}\int_{-\infty}^{\infty} \sqrt{x^2+y^2+z^2}\, e^{-(x^2+y^2+z^2)}\, dz\, dy\, dx$