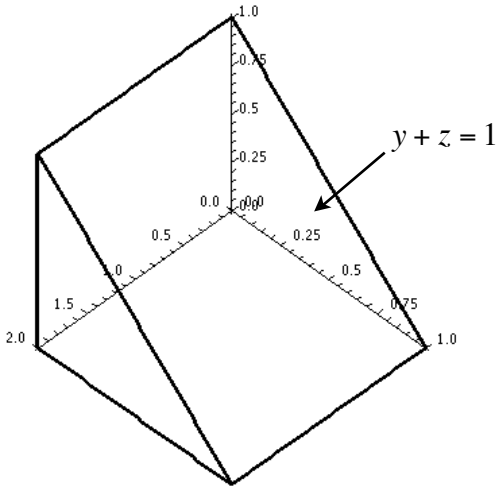
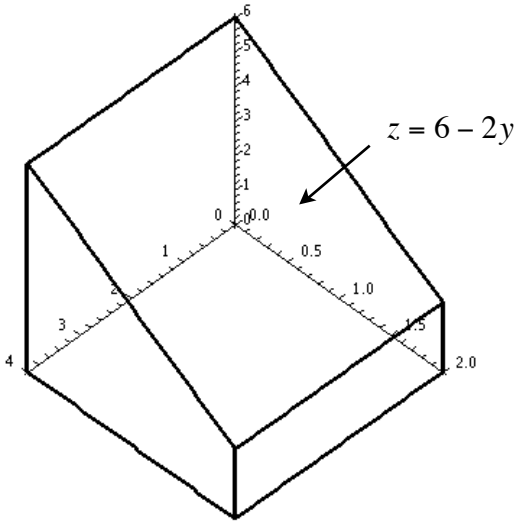
**Math 213 Class 12: Volumes**

1. Find the volume of the figures shown below.



2. Sketch the solid whose volume is given

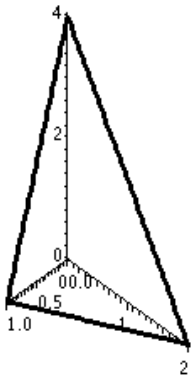
$$\int_0^4 \int_0^{\frac{4-x}{2}} \int_0^{\frac{12-3x-6y}{4}} dzdydx$$

Then rewrite the integral in the order

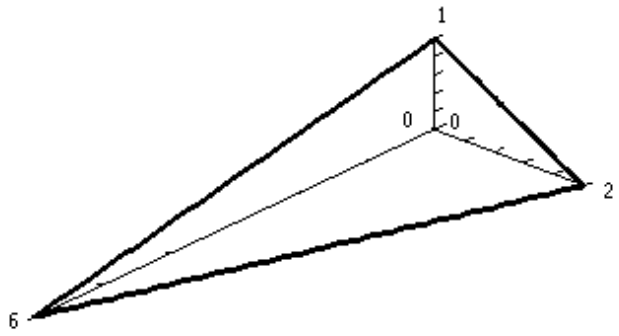
$$\int\int\int dydxdz$$

with the appropriate limits of integration.

3. Find the volume of the tetrahedron bounded by the coordinate planes and the plane $z = 4 - 4x - 2y$.



4. Find the volume of the tetrahedron shown below.



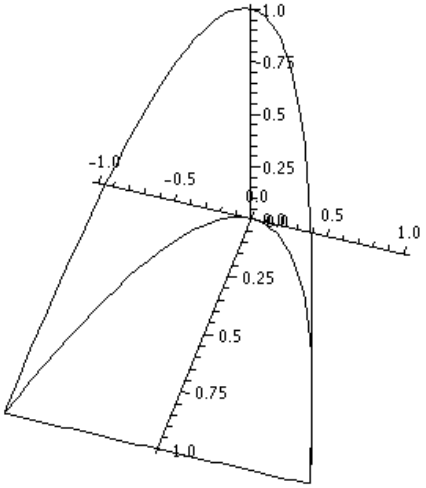
5. **Extra Credit** -
You must show ALL your work!

Compute the volume bounded by

$x = y^2$

$z = 0$

$x + z = 1$



6. **Extra Credit**.
You must show all your work.

Compute the volume of the following pyramid.
(Bounded by the following curve)

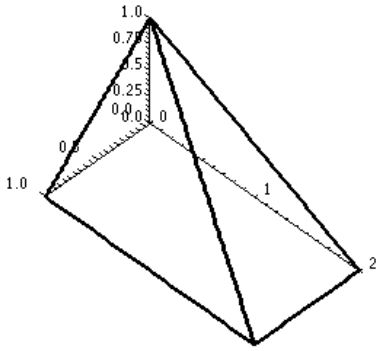
$x = 0$

$y = 0$

$z = 0$

$x + z = 1$

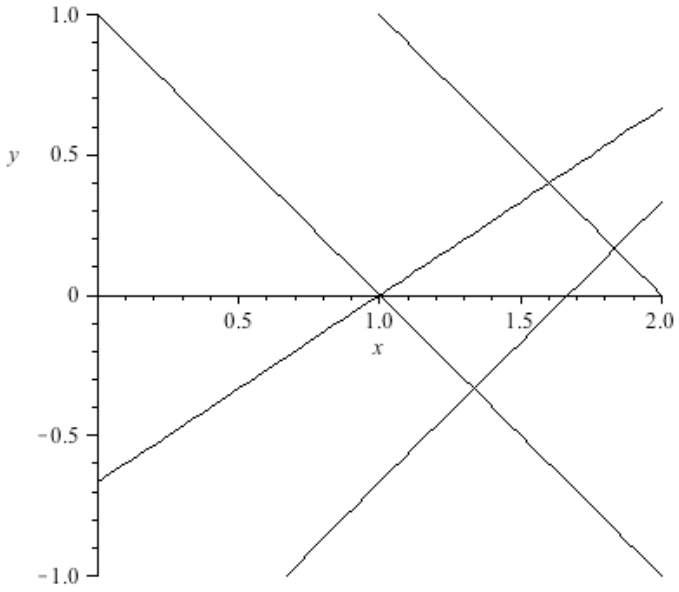
$y + 2z = 2$



**Math 213 Class 12: Transformations**

1. Let $R$ be the region bounded by the graphs:

$$x + y = 1$$
$$x + y = 2$$
$$2x - 3y = 2$$
$$3x - 3y = 5$$




We will use the change of variables $\begin{aligned} x &= \frac{1}{5}(3u + v) \\ y &= \frac{1}{5}(2u - v) \end{aligned}$ to transform the integral.

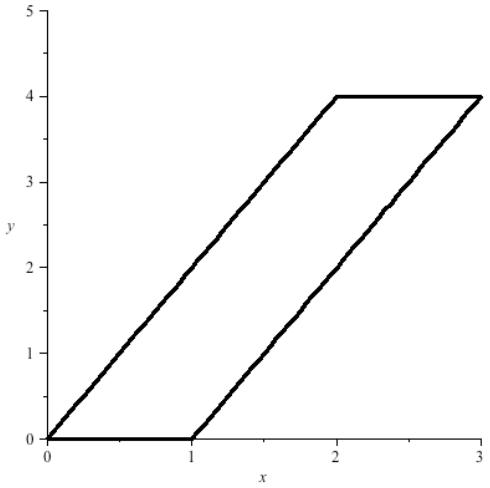
a. Find the Jacobian of the transformation.

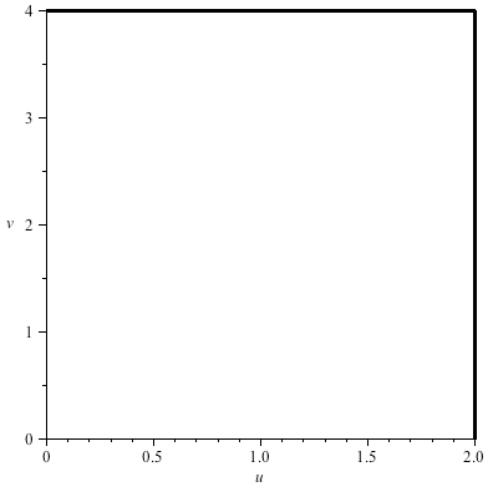
b. Sketch the region in the $uv$ plane.

c. Use the transformation to find the integral for $\iint_R (2x - 3y)\, dA$.

**Math 213 Class 12: Transformations**

2. Transform the region in *xy* pictured below into the region in *uv* pictured below.

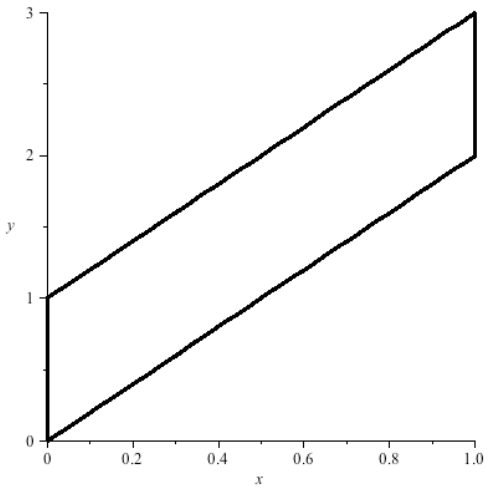


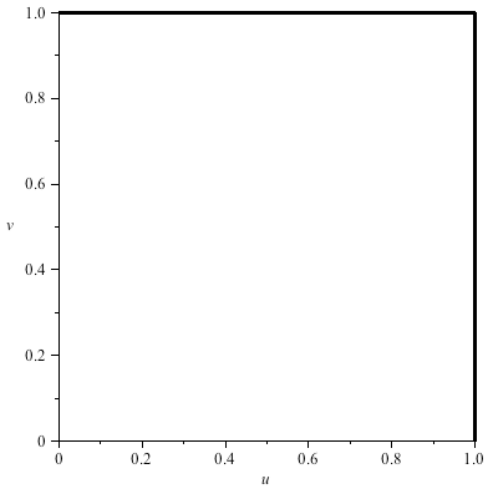




3. Use this transformation to compute $\int_0^4 \int_{x=y/2}^{x=y/2+1} (2x - y)\,dx\,dy$

**Math 213 Class 12: Transformations**

4. Transform the region in *xy* pictured below into the region in *uv* pictured below.




5. Use this transformation to compute $\int\int_R (x+y)\,dxdy$ where $R$ is the $xy$ region.

**Math 213 Class 12: Transformations**

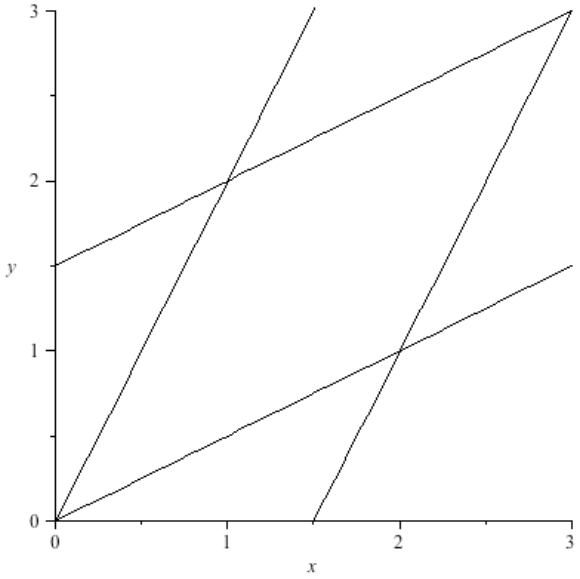
1. Consider the region pictured below bounded by the lines

$y = \frac{1}{2}x$

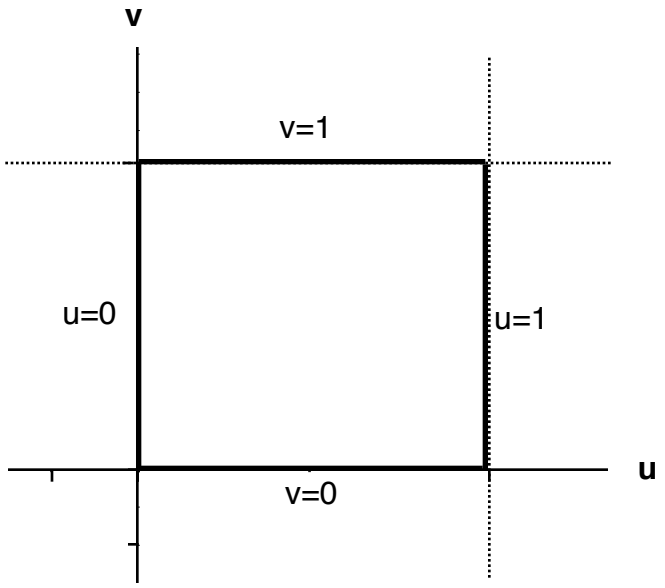
$y = \frac{1}{2}x + \frac{3}{2}$

$y = 2x$

$y = 2x - 3$




Find a change of variables $\begin{aligned} x &= f(u,v) \\ y &= g(u,v) \end{aligned}$ to transform this region into the square region shown below.




$u = 0$

$v = 0$

$u = 1$

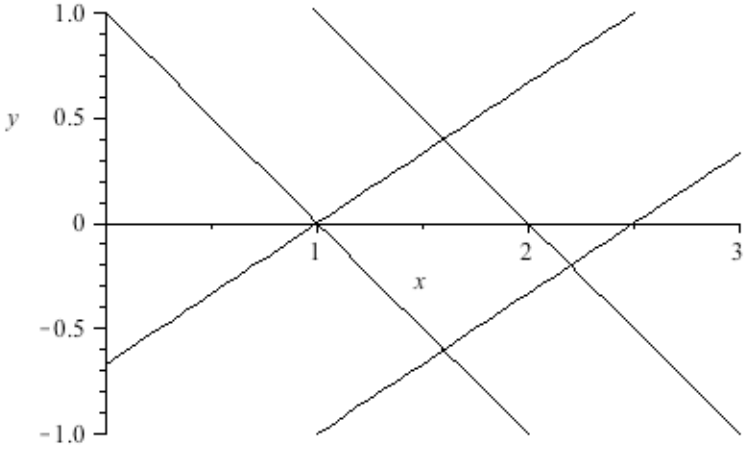
$v = 1$

Calculate the Jacobian for that transformation.

**Math 213 Class 12: Transformations**

2. Consider the region pictured below bounded by the lines

$$y = \frac{2x - 2}{3}$$
$$y = \frac{2x - 5}{3}$$
$$y = 1 - x$$
$$y = 2 - x$$



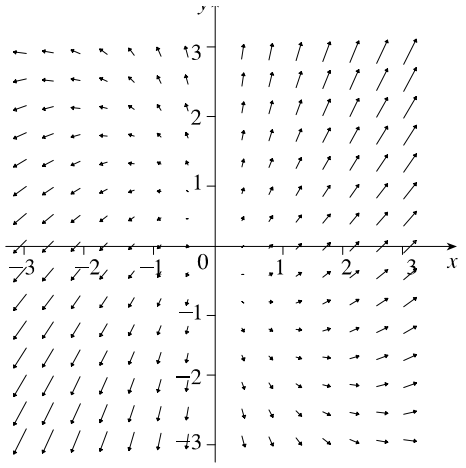

Find a change of variables $\begin{matrix} x = f(u,v) \\ y = g(u,v) \end{matrix}$ to transform this region into a rectangular region in *uv* and calculate the Jacobian of the transformation.

# Math 213 Calculus III

**Reading the Text**

Read Section 13.1, 13.2 and 13.5 and answer the following questions

1. Let $f(x,y)$ be a function of two variables with level curves in the plane corresponding to $f(x,y) = k$. How is the gradient vector field, $\nabla f$ related to these level curves? How does the length of $\nabla f$ vary with the spacing of the curves?
2. Which of the vector fields $[x, x-y]$, $[y, x-y]$, $[x, x+y]$, $[y, x+y]$ describes the plot below?




3. What do we know about div(curl **F**)?
4. If $\mathbf{F}(x,y,z) = [xz, x^2z, x^3z]$ compute div **F**.