

1 Set up the XY matrix for drawing

Edit `make_matrix_from_sequence` to actually build a matrix sequence. Edit `make_pts_representing_circle` to make a matrix representing the points on the circle, Edit `plot_axes_and_circle` to create the XY vertices/geometry for drawing a circle. Note that I'm using `make_matrix_from_sequence` for these examples; it will call the mak

```
In [9]: # Check syntax of call
        seq_rot_trans = [{"type": "rotate", "theta": np.pi/4.0},
                        {"type": "translate", "dx": 1, "dy": 2}]

        mat = mt.make_matrix_from_sequence(seq_rot_trans)
        print(f"Matrix:\n{mat}")
```

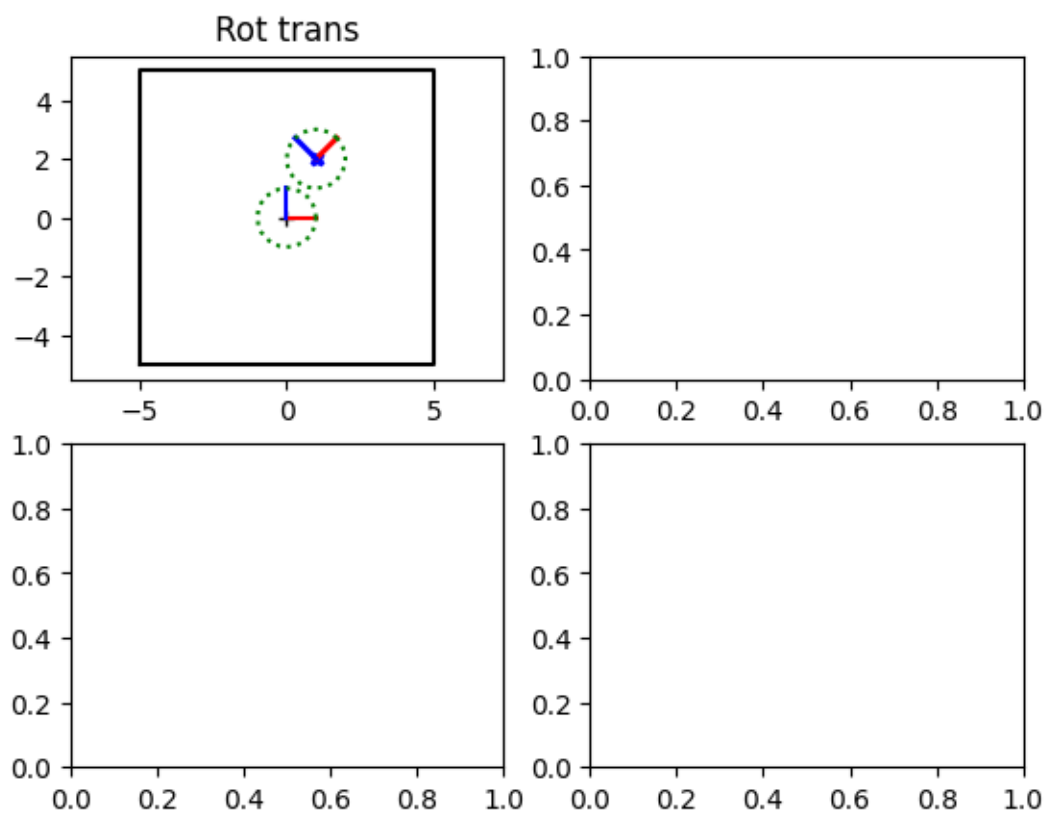
```
Matrix:
[[ 0.71 -0.71  1.  ]
 [ 0.71  0.71  2.  ]
 [ 0.    0.    1.  ]]
```

```
In [129]: # Check syntax of call
          pts = mt.make_pts_representing_circle(25)
          print(pts)
          assert(pts.shape == (3, 25))
```

```
[[ 1.    0.97  0.87  0.71  0.5   0.26  0.   -0.26 -0.5  -0.71 -0.87 -0.97
  -1.   -0.97 -0.87 -0.71 -0.5  -0.26 -0.    0.26  0.5   0.71  0.87  0.97
   1.   ]
 [ 0.    0.26  0.5   0.71  0.87  0.97  1.    0.97  0.87  0.71  0.5   0.26
   0.   -0.26 -0.5  -0.71 -0.87 -0.97 -1.   -0.97 -0.87 -0.71 -0.5  -0.26
  -0.   ]
 [ 1.    1.    1.    1.    1.    1.    1.    1.    1.    1.    1.    1.
   1.    1.    1.    1.    1.    1.    1.    1.    1.    1.    1.
   1.   ]]
```

```
In [10]: # Syntax/draws correctly check (just one plot)
         fig, axs = plt.subplots(2, 2)

         axs[0, 0].set_title("Rot trans")
         mt.plot_axes_and_circle(axs[0, 0], mat)
```

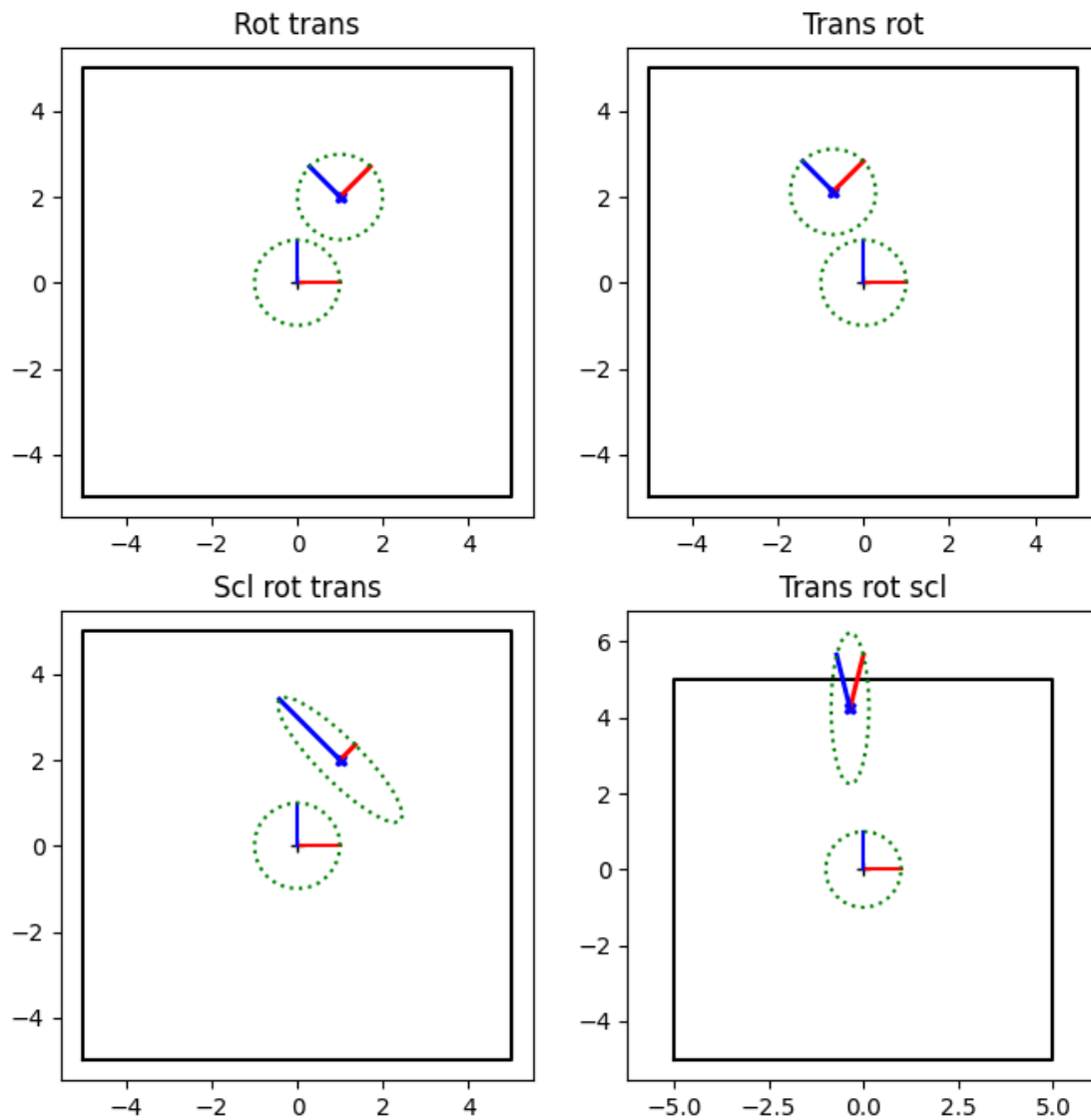


2 Order matters

Edit `example_order_matters()` to create the plot shown in the slides.

Which one of these four transformations is NOT angle-preserving? Why?

```
In [11]: mt.example_order_matters()
```



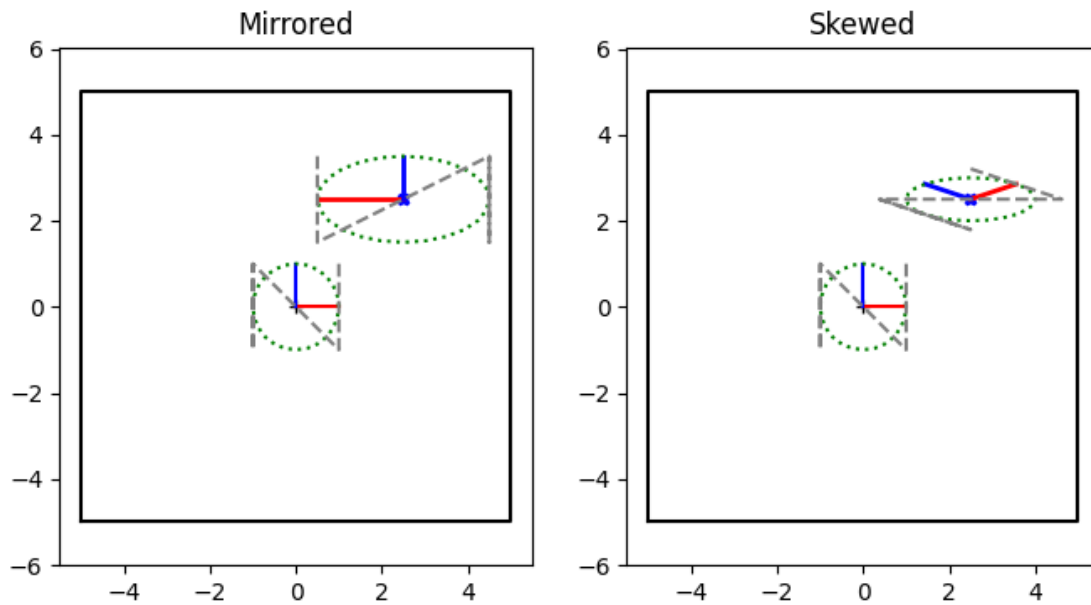
```
In [111]: # Edit this line of code
          print("Translate, Rotation, then Scaling is NOT angle preserving because when rotated first t
```

Translate, Rotation, then Scaling is NOT angle preserving because when rotated first the differing scal

3 Mirroring and skewing

In this problem, edit `example_weird_geometry` to create a mirror and a non-angle preserving matrix. The slides show the ones I made; there are an infinite number of choices.

```
In [12]: mt.example_weird_geometry()
```



4 Geometry is NOT centered around the origin

Edit `example_uncentered_geometry` to create versions of the circle and the zigzag that are in other configurations. - Put the origin in the lower left $(-1, -1)$, rather than the center. This is a pretty common placement. - Orient so that the “up” direction is no longer the y-axis, but is the x-axis. - Do both

The matrix transformation applied to the geometry is the SAME for all of these plots - it’s represented by the red,blue lines. It’s just the geometry that has moved.

```
In [13]: mt.example_uncentered_geometry()
```

