Problem3

September 29, 2016

In [41]:
```
using Plots
# create matrix whose columns contain the coordinates of
# each vertex.
U = [1.0 0 -1 0 1.0; 0 1 0 -1 0]

theta = pi/4.0

# Create a red unit square
# Note U(1,:) denotes the first row of U
plot(U[1,:]',U[2,:]',fill=(0,:red))

# Perform rotation.
R = [cos(theta) -sin(theta); sin(theta) cos(theta)];
V = R*U;
# Plot the blue square
plot!(V[1,:]', V[2,:]',fill=(0,:blue))
savefig("problem3")
```

In [42]:
```
using Plots
# create matrix whose columns contain the coordinates of
# each vertex.
U = [5 6 4 5; 0 2 1 0]

theta = pi/2.0

# Create a red triangle
# Note U(1,:) denotes the first row of U
plot(U[1,:]',U[2,:]',fill=(0,:red))

# Perform rotation.
R = [cos(theta) -sin(theta); sin(theta) cos(theta)];
V = R*U;
# Plot the blue square
plot!(V[1,:]', V[2,:]',fill=(0,:blue))

# Perform rotation.
W = R*V;
# Plot the blue square
plot!(W[1,:]', W[2,:]',fill=(0,:green))

# Perform rotation.
Z = R*W;
# Plot the blue square
```

```
plot!(Z[1,:]', Z[2,:]',fill=(0,:yellow))
savefig("problem3partA")
```

In [43]:
```
using Plots
# create matrix whose columns contain the coordinates of
# each vertex.
U = [1.0 0 -1 0 1.0; 0 1 0 -1 0]

theta = pi/4.0

# Create a red unit square
# Note U(1,:) denotes the first row of U
plot(U[1,:]',U[2,:]',fill=(0,:red))


# Perform rotation.
R = [cos(theta) -sin(theta); sin(theta) cos(theta)];
V = R*U;
# Plot the blue square
plot!(V[1,:]', V[2,:]',fill=(0,:blue))

# Perform counter rotation.
R = [cos(-theta) -sin(-theta); sin(-theta) cos(-theta)];
W = R*V;
# Plot the blue square
plot!(W[1,:]', W[2,:]',fill=(0,:green))
savefig("problem3partB")
```

In [44]:
```
using Plots
# create matrix whose columns contain the coordinates of
# each vertex.
U = [1.0 0 -1 0 1.0; 0 1 0 -1 0]

theta = pi/3.0

# Create a red unit square
# Note U(1,:) denotes the first row of U
plot(U[1,:]',U[2,:]',fill=(0,:red))


# Perform rotation.
R = [cos(theta) -sin(theta); sin(theta) cos(theta)];
V = R*U;
# Plot the blue square
plot!(V[1,:]', V[2,:]',fill=(0,:blue))

# Perform counter rotation.
R = [cos(-theta) -sin(-theta); sin(-theta) cos(-theta)];
W = R*V;
# Plot the blue square
plot!(W[1,:]', W[2,:]',fill=(0,:green))
savefig("problem3partC")
```

In [17]:
```
theta = pi/4.0
@show [cos(theta) -sin(theta); sin(theta) cos(theta)] * [cos(-theta) -sin(-theta); sin(-theta)
```

```
        theta = pi/3.0
        @show [cos(theta) -sin(theta); sin(theta) cos(theta)] * [cos(-theta) -sin(-theta); sin(-theta)
```

```
[cos(theta) -(sin(theta));sin(theta) cos(theta)] * [cos(-theta) -(sin(-theta));sin(-theta) cos(-theta)]
 0.0 1.0]
[cos(theta) -(sin(theta));sin(theta) cos(theta)] * [cos(-theta) -(sin(-theta));sin(-theta) cos(-theta)]
 0.0 1.0]
```

```
Out[17]: 2x2 Array{Float64,2}:
          1.0  0.0
          0.0  1.0
```

```
In [45]: using Plots
         # create matrix whose columns contain the coordinates of
         # each vertex.
         U = [1.0 0 -1 0 1.0; 0 1 0 -1 0]

         theta = pi/8.0

         # Create a red unit square
         # Note U(1,:) denotes the first row of U
         plot(U[1,:]',U[2,:]',legend=false,fill=(0,:red))

         N=50
         for i=1:N
             # Perform rotation.
             R = [cos(theta) -sin(theta); sin(theta) cos(theta)];
             U = 0.9*R*U;
             # Plot the blue square
             plot!(U[1,:]', U[2,:]',fill=(0,:blue))
         end
         savefig("problem3partC")
```

```
In [46]: using Plots
         using FileIO
         using ImageMagick


         # create matrix whose columns contain the coordinates of
         # each vertex.
         U = [1.0 0 -1 0 1.0; 0 1 0 -1 0]

         theta = pi/8.0

         # Create a red unit square
         # Note U(1,:) denotes the first row of U
         plot(U[1,:]',U[2,:]',legend=false, fill=(0,:red))

         N=50
         for i=1:N
             # Perform rotation.
             R = [cos(theta) -sin(theta); sin(theta) cos(theta)];
             U = 0.9*R*U + [1 1 1 1 1; 2 2 2 2 2];
             # Plot the blue square
             plot!(U[1,:]', U[2,:]',fill=(0,:blue))
```

```
        end
        savefig("problem3partD")
```

In [ ]: