

MAT 343 LAB 4 - Jordan Ledbetter

Question 1

```
type lab4_exercise1.m    %print the M-file for question 1
```

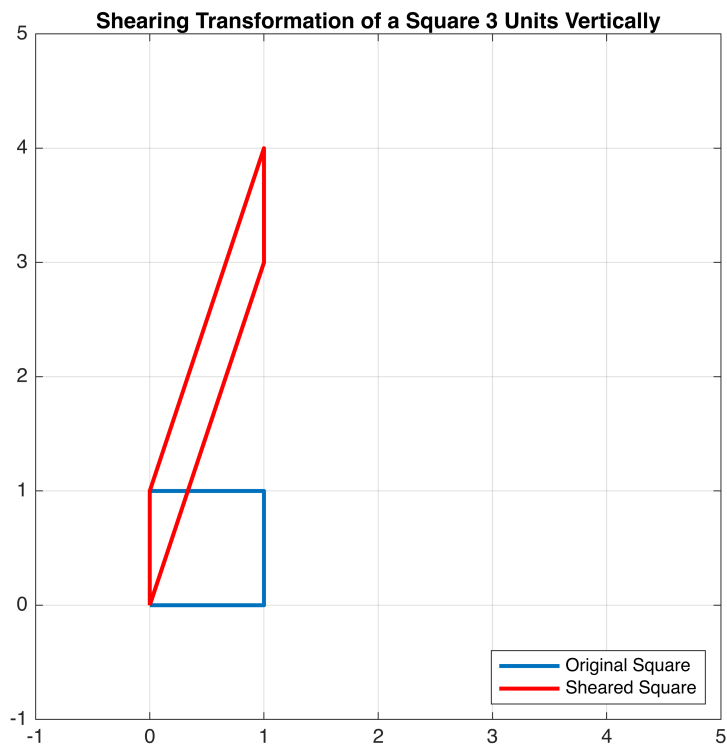
```
clf
S = [0,1,1,0,0;0,0,1,1,0];
plot(S(1,:), S(2,:), 'linewidth', 2)
hold on

T = [1,0;3,1];
TS = T * S;

plot(TS(1,:), TS(2,:), '-r', 'linewidth', 2);

title('Shearing Transformation of a Square 3 Units Vertically')
legend('Original Square', 'Sheared Square','location','southeast')
axis equal, axis([-1,5,-1,5]); grid on
hold off
```

```
lab4_exercise1    % run the M-file for question 1
```



Question 2

```
type lab4_exercise2.m    %print the M-file for question 2
```

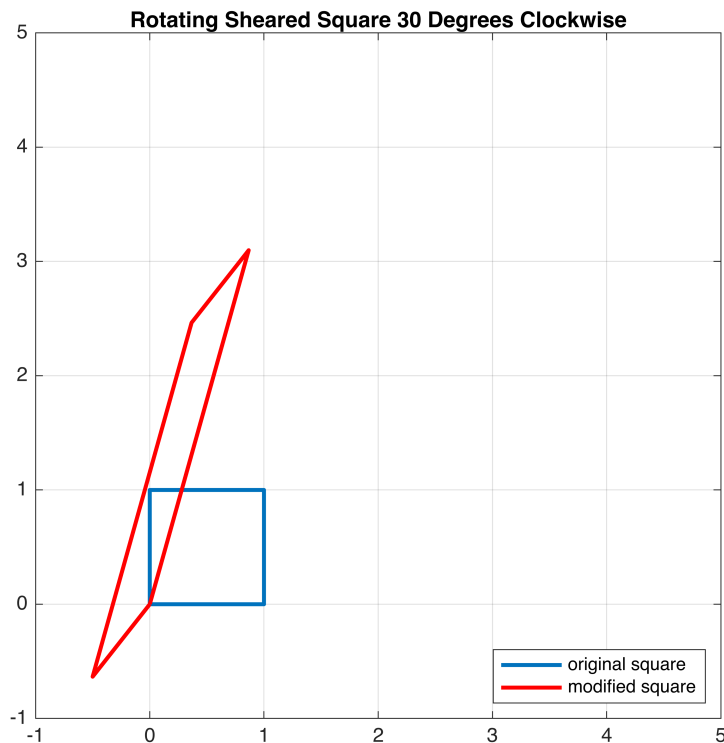
```
clf
S = [0,1,1,0,0;0,0,1,1,0];
T = [1,0;3,1];
```

```

theta = pi/6;
Q = [cos(theta), -sin(theta); sin(theta), cos(theta)];
plot(S(1,:),S(2,:), 'linewidth',2);
hold on;
TQS = T * Q * S;
plot(TQS(1,:),TQS(2,:), '-r', 'linewidth',2);
title('Rotating Sheared Square 30 Degrees Clockwise')
legend('original square', 'modified square','location','southeast')
axis equal; axis ([-1,5,-1,5]); grid on
hold off

```

lab4_exercise2 % run the M-file for question 2



Is the result the same as Example? Does the order of the transformations matter?

Answer: The result is not the same as the example provided because the order of transformation matters. In the example, the square was first rotated 30 degrees then sheared, which makes the figure appear more like a diamond that stretches across the graph. On the other hand, the graph created is first sheared then rotated; therefore, the modified square appears horizontally compressed.

Question 3

type lab4_exercise3.m %print the M-file for question 3

```

clf
S = [0,1,1,0,0;0,0,1,1,0];
theta = pi/7;
D1 = [cos(theta), -sin(theta); sin(theta), cos(theta)];
p = plot(S(1,:),S(2,:), 'linewidth',2);

```

```

axis([-2,2,-2,2])
axis square, grid on
hold on

for i = 1:14
    S = D1 * S;
    set(p, 'xdata', S(1,:), 'ydata', S(2,:));
    pause(0.3)
end
pause(1)

D2 = [cos(-theta), -sin(-theta); sin(-theta), cos(-theta)];
for i = 1:14
    S = D2 * S;
    set(p, 'xdata', S(1,:), 'ydata', S(2,:));

    pause(0.3)
end
hold off;

```

Question 4

```
type lab4_exercise4.m    %print the M-file for question 4
```

```

clf
S = [0,1,1,0,0;0,0,1,1,0];
theta = pi/7;
D1 = [cos(theta), -sin(theta); sin(theta), cos(theta)];
dilate = 8/7*eye(2);
p = plot(S(1,:), S(2,:), 'linewidth', 2);
axis([-7,7,-7,7])
axis square, grid on
hold on

for i = 1:14
    S = D1 * dilate * S;
    set(p, 'xdata', S(1,:), 'ydata', S(2,:));
    pause(0.3)
end
pause(1)

dilate = 7/8*eye(2);
D2 = [cos(-theta), -sin(-theta); sin(-theta), cos(-theta)];
for i = 1:14
    S = D2 * dilate * S ;
    set(p, 'xdata', S(1,:), 'ydata', S(2,:));
    pause(0.3)
end
hold off;

```

Question 5

```
type lab4_exercise5.m    %print the M-file for question 5
```

```

clf
S = [0,1,1,0,0;0,0,1,1,0;1,1,1,1,1];
M = [1,0,4;0,-1,0;0,0,1];
MS = M * S;
plot(MS(1,:), MS(2,:), 'k', 'linewidth', 2);
hold on
R = [0,1,0;1,0,0;0,0,1];

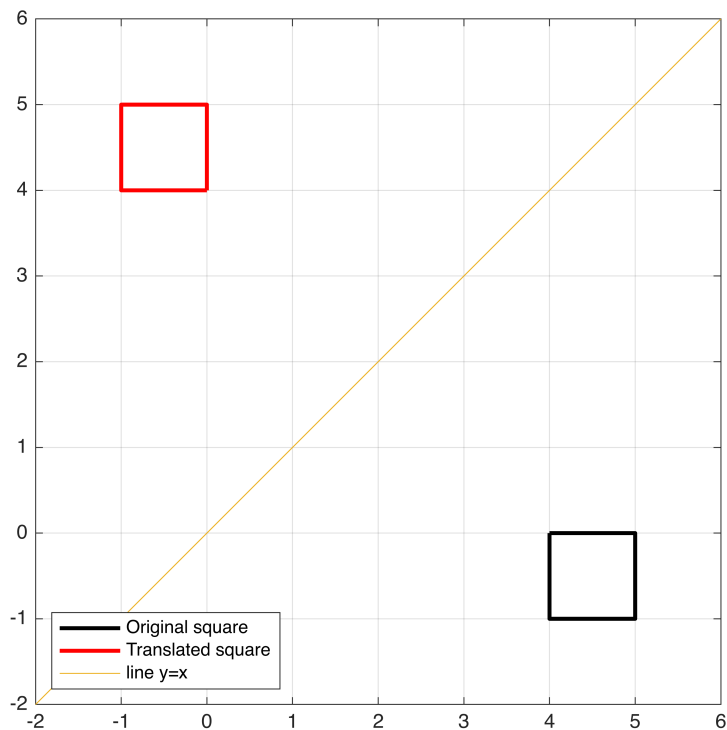
```

```

RMS = R * MS;
plot(RMS(1,:),RMS(2,:), 'r', 'linewidth',2);
plot([-2,6],[-2,6])
legend('Original square','Translated square','line y=x','location','southwest');
axis equal, axis([-2,6,-2,6]); grid on
hold off

```

lab4_exercise5 % run the M-file for question 5



Question 6

type lab4_exercise6.m %print the M-file for question 6

```

clf
S=[0,1,1,0,0;0,0,1,1,0;1,1,1,1,1];
M1 = [1,0,0.1;0,1,0;0,0,1];
M2 = [1,0,0;0,1,0.1;0,0,1];
M3 = [1,0,-0.1;0,1,-0.1;0,0,1];
p = plot(S(1,:),S(2,:));
axis square, axis([-1,6,-1,6]), grid on
for i = 1:40
    S = M1*S;
    set(p,'xdata',S(1:,:), 'ydata',S(2,:));
    pause(0.1)
end
for i = 1:40
    S=M2*S;
    set(p,'xdata',S(1:,:), 'ydata',S(2,:));
    pause(0.1)
end
for i = 1:40

```

```

    S = M3 * S;
    set(p,'xdata',S(1,:),'ydata',S(2,:));
    pause(0.1);
end

```

Question 7

```

type lab4_exercise7.m    %print the M-file for question 7

```

```

clf
S=[0,1,1,0,0;0,0,1,1,0;1,1,1,1,1];
M1 = [1,0,0.1;0,1,0;0,0,1];
theta = pi/12;
Q=[cos(theta),-sin(theta),0;sin(theta),cos(theta),0;0,0,1];
QP=[1,0,5;0,1,0;0,0,1]*Q*[1,0,-5;0,1,0;0,0,1];
p = plot(S(1,:),S(2,:));
axis equal, axis([-0.5,7,-2,5]), grid on
for i = 1:40
    S = M1*S;
    set(p,'xdata',S(1,:),'ydata',S(2,:))
    pause(0.1)
end
for i = 1:6
    S=QP*S;
    set(p,'xdata',S(1,:),'ydata',S(2,:))
    pause(0.1)
end

M2 = [1,0,-0.1;0,1,0;0,0,1];
Q = [cos(theta), sin(theta),0; - sin(theta), cos(theta),0;0,0,1];
QP = [1,0,1;0,1,0;0,0,1]*Q*[1,0,-1;0,1,0;0,0,1];
for i = 1:40
    S = M2 * S
    set(p,'xdata',S(1,:),'ydata',S(2,:))
    pause(0.1)
end
for i = 1:6
    S = QP * S;
    set(p,'xdata',S(1,:),'ydata',S(2,:))
    pause(0.1)
end

```