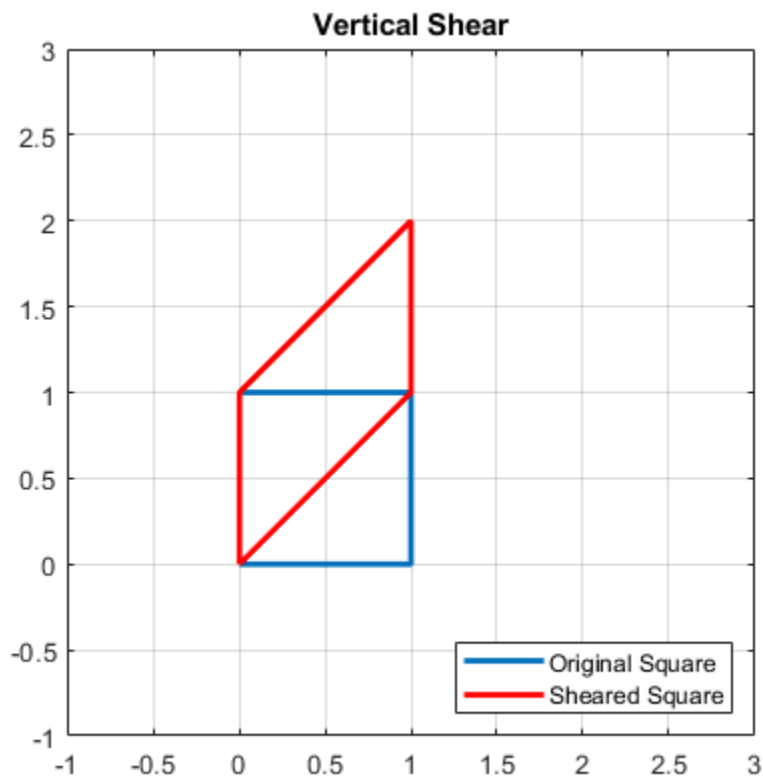


---

# MAT343 LAB3

## 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;1,1];
TS = T*S;
plot(TS(1,:),TS(2,:), '-r', 'linewidth',2);
title('Vertical Shear')
legend('Original Square', 'Sheared Square', 'location', 'southeast')
axis equal, axis([-1,3,-1,3]); grid on
hold off
```



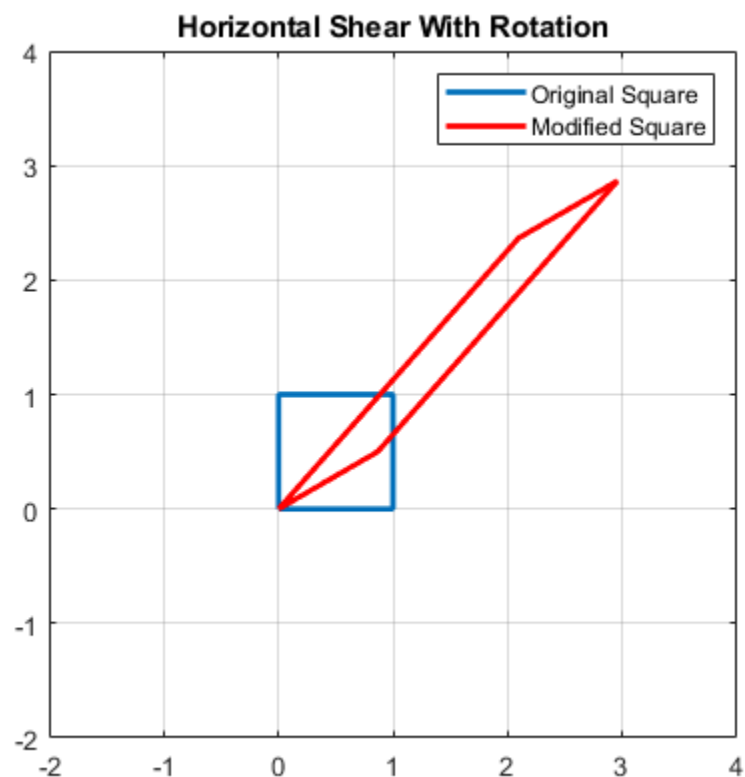
## Question 2

```
clf
S = [0,1,1,0,0;0,0,1,1,0];
plot(S(1,:),S(2,:), 'linewidth',2)
hold on
T = [1,3;0,1];
Q = [cos(pi/6), -sin(pi/6); sin(pi/6), cos(pi/6)];
```

```

QTS = Q*T*S;
plot(QTS(1,:),QTS(2,:), '-r', 'linewidth', 2);
title('Horizontal Shear With Rotation')
legend('Original Square', 'Modified Square', 'location', 'northeast')
axis equal, axis([-2,4,-2,4]); grid on
hold off
% The order matters, as you can see. In Example5, it rotated and
then
% sheared the original square. Whereas, we are trying to shear and
then
% rotate the square. The result looks identical to a reflected
vertical
% shear. So we can say that order does matter.

```



### Question 3

```

type('Question3.m')

clf
S=[0,1,1,0,0;0,0,1,1,0];
theta = pi/8;
p = plot(S(1,:),S(2,:));
axis equal, axis([-2,2,-2,2]), grid on;
hold on
Q = [cos(theta),-sin(theta);sin(theta),cos(theta)];
for i = 1:16

```

```
S = Q*S;
set(p,'xdata',S(1,:),'ydata',S(2,:));
pause(0.1)
end
QC = [cos(theta),sin(theta);-sin(theta),cos(theta)];
for i = 1:16
    S = QC*S;
    set(p,'xdata',S(1,:),'ydata',S(2,:));
    pause (0.1)
end
hold off
```

#### Question 4

```
type('Question4.m')

clf
S = [0,1,1,0,0;0,0,1,1,0];
D1 = 9/8*eye(2);
theta = pi/8;
p = plot(S(1,:),S(2,:));
axis equal, axis([-8,8,-8,8]); grid on
hold on
Q = [cos(theta),-sin(theta);sin(theta),cos(theta)];
for i = 1:16
    S = Q*S;
    set(p,'xdata',S(1,:),'ydata',S(2,:));
    S = D1*S;
    set(p,'xdata',S(1,:),'ydata',S(2,:));
    pause(0.1)
end
D2 = 8/9*eye(2);
QC = [cos(theta),sin(theta);-sin(theta),cos(theta)];
for i = 1:16
    S = QC*S;
    set(p,'xdata',S(1,:),'ydata',S(2,:));
    S = D2*S;
    set(p,'xdata',S(1,:),'ydata',S(2,:));
    pause (0.1)
end
hold off
```

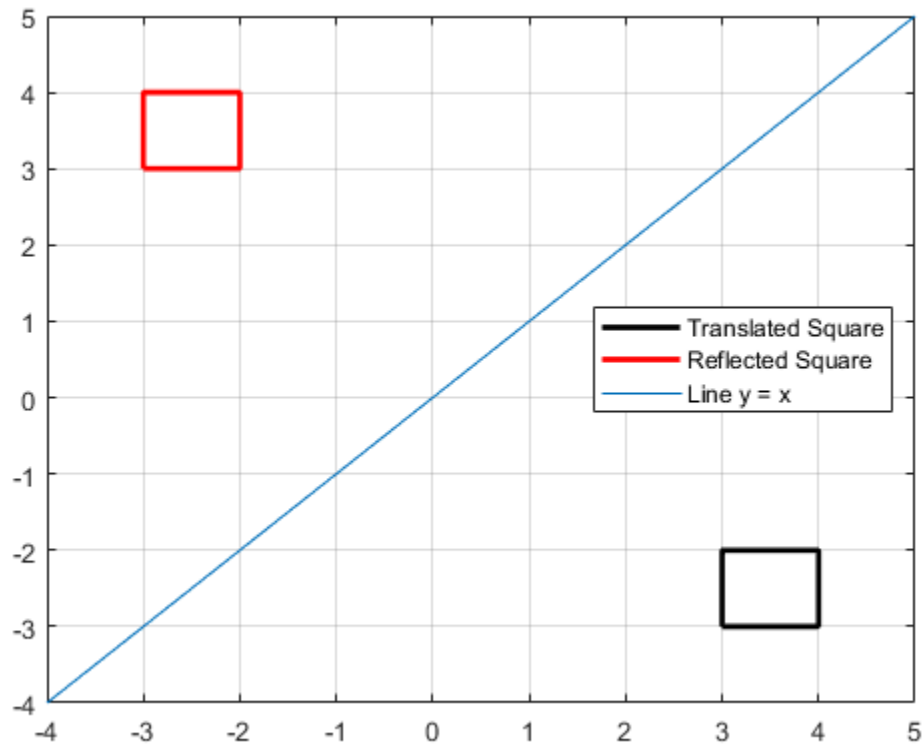
#### Question 5

```
clf
M = [1,0,3;0,1,-3;0,0,1];
S = [0,1,1,0,0;0,0,1,1,0;1,1,1,1,1];
MS = M*S;
plot(MS(1,:),MS(2,:),'-k','linewidth',2);
hold on
R = [0,1,0;1,0,0;0,0,1];
RS = R*MS;
plot(RS(1,:),RS(2,:),'-r','linewidth',2);
plot([-4,5],[-4,5]);
```

```

legend('Translated Square','Reflected Square','Line y =
x','location','east')
axis([-4,5,-4,5]); grid on
hold off

```



## Question 6

```

type('Question6.m')

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 = inv(M2);
M4 = inv(M1);
p = plot(S(1,:),S(2,:));
axis([-1,6,-1,6]), grid on;
axis square
figure(gcf)
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
    for i = 1:40
        S = M4*S ;
        set (p,'xdata',S(1,:),'ydata',S(2,:));
        pause(0.1)
    end
end
```

#### Question 7

```
type('Question7.m')

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 = inv(M1);
theta = pi/8;
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];
QP2 = [1,0,1;0,1,0;0,0,1]*Q*[1,0,-1;0,1,0;0,0,1];
p = plot(S(1,:),S(2,:));
axis([-0.5,7,-2,5]), grid on;
axis equal;
figure(gcf)
for i = 1:40
    S = M1*S;
    set(p,'xdata',S(1,:),'ydata',S(2,:));
    pause(0.1)
end
for i = 1:4
    S = QP*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 = 1:4
    S = QP2*S;
    set(p,'xdata',S(1,:),'ydata',S(2,:));
    pause(0.1)
end
```

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