ENGR 231 – Linear Engineering Systems
Lab 6: Homogeneous Coordinates and Tessellations

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As a convenience, this **answer template** is provided if you wish to easily submit your work. Be sure to save it as a PDF before submitting online!

Question 1. Translation in homogeneous coordinates.

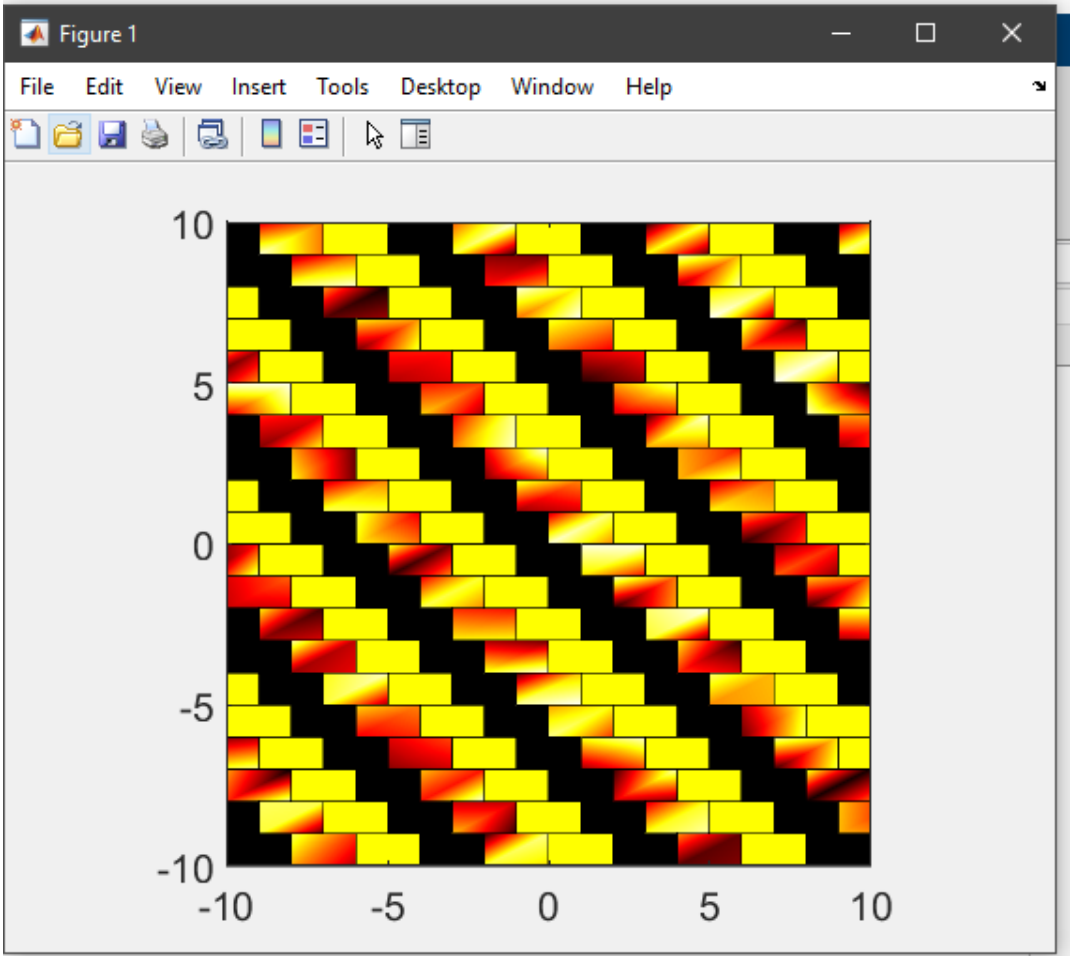
Question 1: Paste your code for translate(dx,dy) here, then include the output for the line included near the bottom.

```
function [ T ] = translate( dx, dy )
    % Returns a matrix T to translate a 2d vector, represented in homogeneous
    % coordinates by dx and dy.
    % Define T here. Be sure to terminate with a semicolon.
    T = [1,0,dx;0,1,dy;0,0,1];
end
```

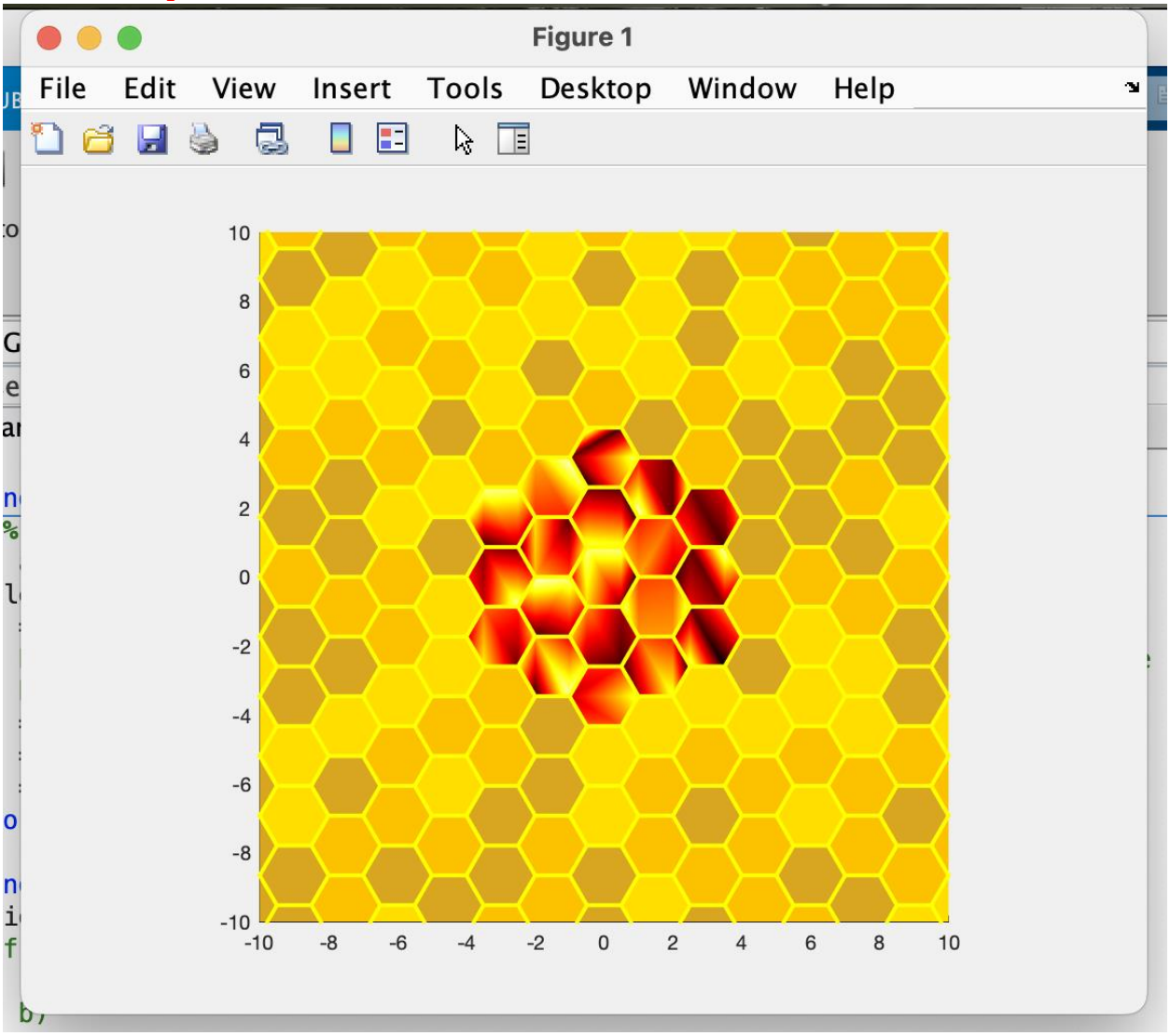
Show the result for the following command.

```
>> translate(5,-5) * [15; 25; 1]
[20;20;1]
```

Questions 2-4: Paste your completed rectangular tessellation (in the answer template). (3 points)
Make sure the tiles alternate with at least two colors and some are filled using bilinear interpolation



Questions 5-7: Paste in your completed honeycomb for three points! The sample includes additional tricks using 'facealpha' so the cells fade near the edges, which yours should not. Your image must not be circular. That's just for the sample.



Question 8: Paste your code for rotate(angle_in_deg) here, then include the output for the line included near the bottom.

```
%% Rotate Function

function [ T ] = rotate(angle_in_deg)

    T = [dcos(angle_in_deg), -dsin(angle_in_deg), 0; dsin(angle_in_deg), dcos(angle_in_deg), 0; 0,0,1];

End
```

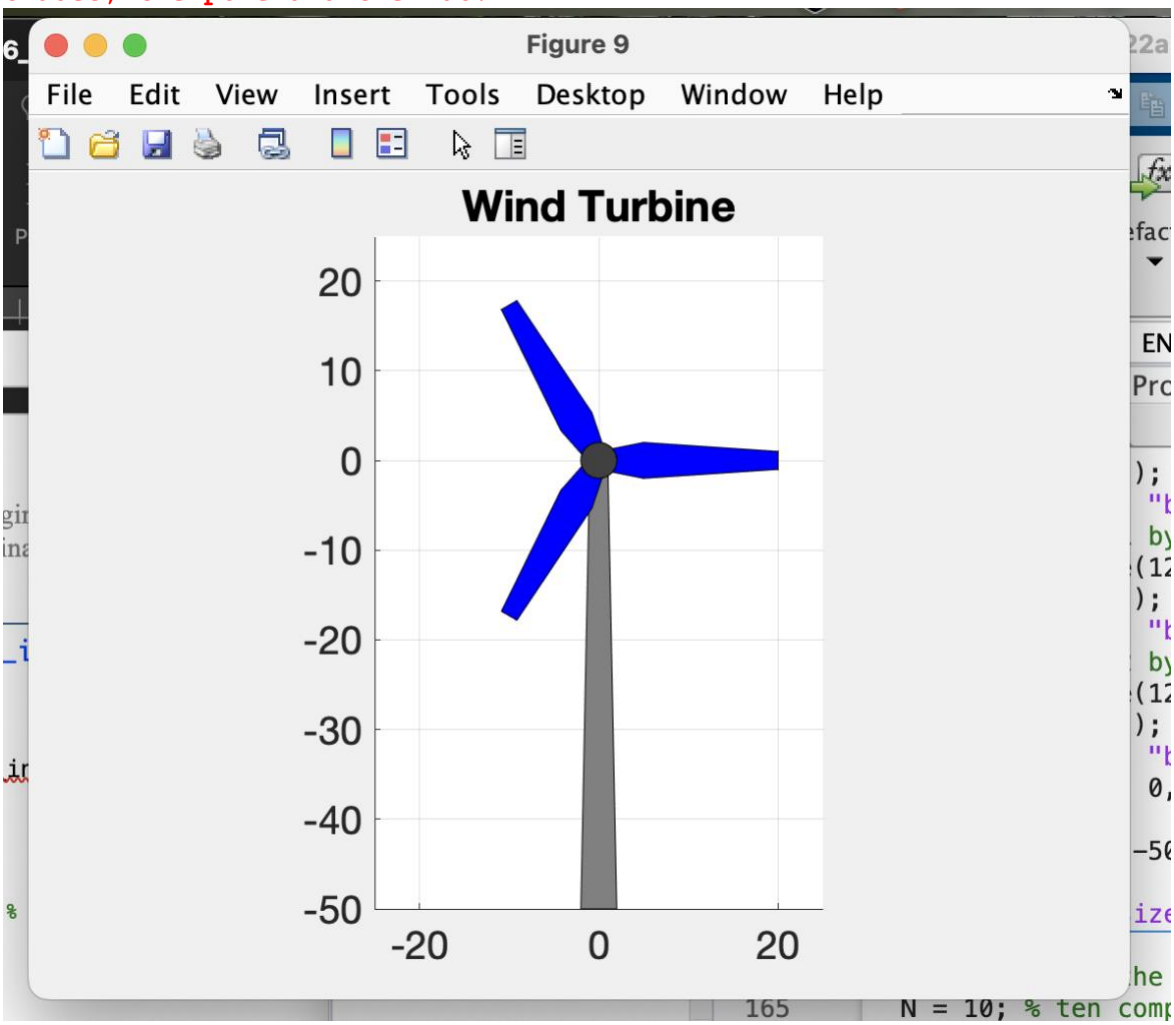
Give the value of n after the following commands.

```
Z = rotate(30) * [20; 21; 1]; z = Z(1:2) % grab just the first two components
n = norm(z)
```

z = [6.8205;28.1865]

n = 29

Question 9: Paste in your completed wind turbine including all three blades, the pole and the hub.



Question 10: Paste in your completed for loop for the animated wind turbine.

```
for k = 1 : 72*N
    % delete the previous position of each blade and the old hub
    delete(hub)
    % delete  h1, h2 and h3 here
  delete(h1)
  delete(h2)
  delete(h3)
    % rotate each blade by delta
    % redefine  blade1, blade2 and blade3 here - rotate each by delta
  blade1 = rotate(delta)*blade1;
  blade2 = rotate(delta)*blade2;
  blade3 = rotate(delta)*blade3;
    % draw all three blades using fill. Use the handles h1, h2 and h3 as before
  x = blade1(1, :); y = blade1(2, :);
  h1 = fill(x, y, "blue");
  x = blade2(1, :); y = blade2(2, :);
  h2 = fill(x, y, "blue");
  x = blade3(1, :); y = blade3(2, :);
  C = rand(size(x)); % For fun, color third blade bilinear interpolation
  h3 = fill(x, y, C);
    % draw the hub again
    hub = circle(0, 0, 2);
    pause(0.025)
end
```

Ready to Submit?

Be sure all ten questions are answered. When your lab is complete, be sure to submit three files:

1. Your **completed Answer Template** as a PDF file
2. A copy of your **MATLAB Live Script**
3. A **PDF** copy of your **MATLAB Live Script** (Save-Export to PDF…)

The due date is the day after your lab section by **11:59pm** to receive full credit. You have one more day, to submit the lab (but with a small penalty), and then the window closes for good and your grade will be zero.