MATLAB, Lab 4 – Individual work

The function RegPoly draws the polygon centered at point (x0, y0). It is circumscribed by a circle of radius r, and contains n sides. The code of RegPoly is presented below

```
function RegPoly (xo, yo, r, n)
% Draws a regular polygon
% xo, yo - coordinates of the centre of the polygon
% r - the radius of the circle that circumscribes the polygon
% n - the number of the polygon sides

alpha = linspace (0, 2*pi, n+1);
x = xo + r * cos(alpha);   % conversion of polar to Cartesian
y = yo + r * sin(alpha);   % as above
d = distNp (x, y);         % we use the function "distNp"

% plot the polygon:
plot (x, y);  grid on;
axis equal;
legend (['d = ', num2str(d)]);
```

Please note, that the function calls distNp described on the lecture, which has to be placed in the same folder as RegPoly. With the use of these functions work on the tasks below:

1. Is there any other way of computing x and y from polar coordinates? Check function *pol2cart* in help, and try to apply it in the code above. Paste the modified code below.

Code:

```
function RegPoly (xo, yo, r, n)
% Draws a regular polygon
% xo, yo - coordinates of the centre of the polygon
% r - the radius of the circle that circumscribes the polygon
% n - the number of the polygon sides

alpha = linspace (0, 2*pi, n+1);

[x,y] = pol2cart(alpha,r);  %transforms polar coordinates to Cartesian
x=x+xo;  % adds center coordinates of the polygon
y=y+yo;  % as above
d = distNp (x, y);     % we use the function "distNp"

% plot the polygon:
plot (x, y);  grid on;
axis equal;
legend (['d = ', num2str(d)]);
```

2. How to compute the value of π with the function RegPoly? Show the result of example calculation.

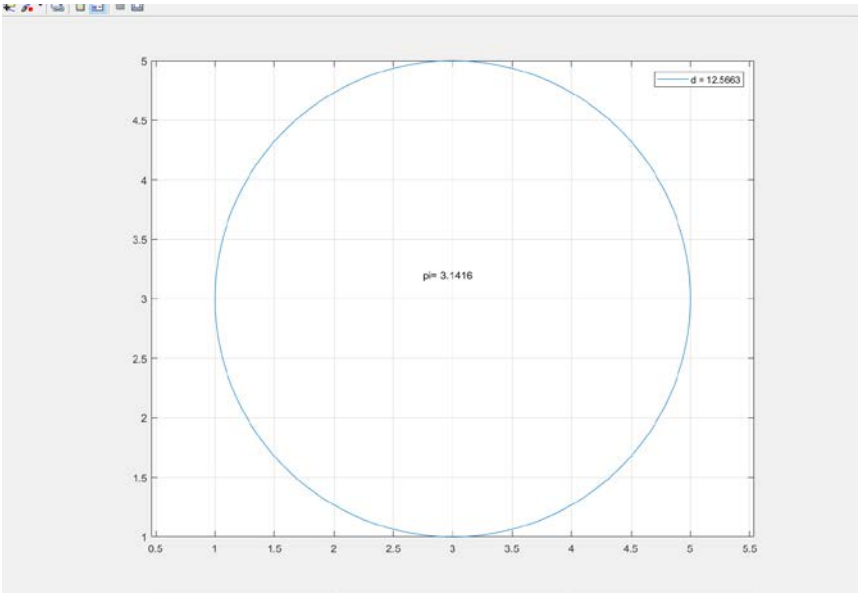
Code:

```
function RegPoly (xo, yo, r, n)
% Draws a regular polygon
% xo, yo - coordinates of the centre of the polygon
% r - the radius of the circle that circumscribes the polygon
% n - the number of the polygon sides // in this case n must be high enough to draw a circle

alpha = linspace (0, 2*pi, n+1);
x = xo + r * cos(alpha);    % conversion of polar to Cartesian
y = yo + r * sin(alpha);    % as above
d = distNp (x, y); % we use the function “distNp”
value = d / (2*r) ; % This variable corresponds value of pi

% plot the polygon:
plot (x, y);  grid on;
axis equal;
legend (['d = ', num2str(d)]);
text(0.45,0.55,['pi= ',num2str(value)],'Units','normalized');
```

Result:



3. Write the function that computes the area of the polygon. An area of triangle can be calculated from formula $S = \frac{1}{2}absin\gamma$

Code:

```
function RegPoly (xo, yo, r, n)

alpha = linspace (0, 2*pi, n+1);
x = xo + r * cos(alpha);
y = yo + r * sin(alpha);
d = distNp (x, y);
```

```
S=AreaPoly(n,r);
disp(['Area = ',num2str(S)]);


plot (x, y);  grid on;
axis equal;
legend (['d = ', num2str(d)]);

function A = AreaPoly(n,r)
A=0.25*n*r.^2*cot(pi/n);
```

4. How to compute the value of π with the use of function developed in point 4? Show the result of example calculation.

Code:

```
function RegPoly (xo, yo, r, n)

alpha = linspace (0, 2*pi, n+1);
x = xo + r * cos(alpha);
y = yo + r * sin(alpha);
d = distNp (x, y);

S=AreaPoly(n,r);
var1 = S / (0.25*n*r.^2);
var2 = acot(var1);
var3 = n * var2;

disp(['Area = ',num2str(S)]);
disp(['pi = ',num2str(var3)]);


plot (x, y);  grid on;
axis equal;
legend (['d = ', num2str(d)]);

function A = AreaPoly(n,r)
A=0.25*n*r.^2*cot(pi/n);
```

Result:

```
>> RegPoly(0,0,6,8)
Area = 173.8234
pi = 3.1416

>> RegPoly(4,2,5,9)
Area = 154.5456
```

```
pi = 3.1416

>> RegPoly(8,6,9,7)
Area = 294.3469
pi = 3.1416
```