Plotting antenna radiation patterns:

polar.m from MATLAB:

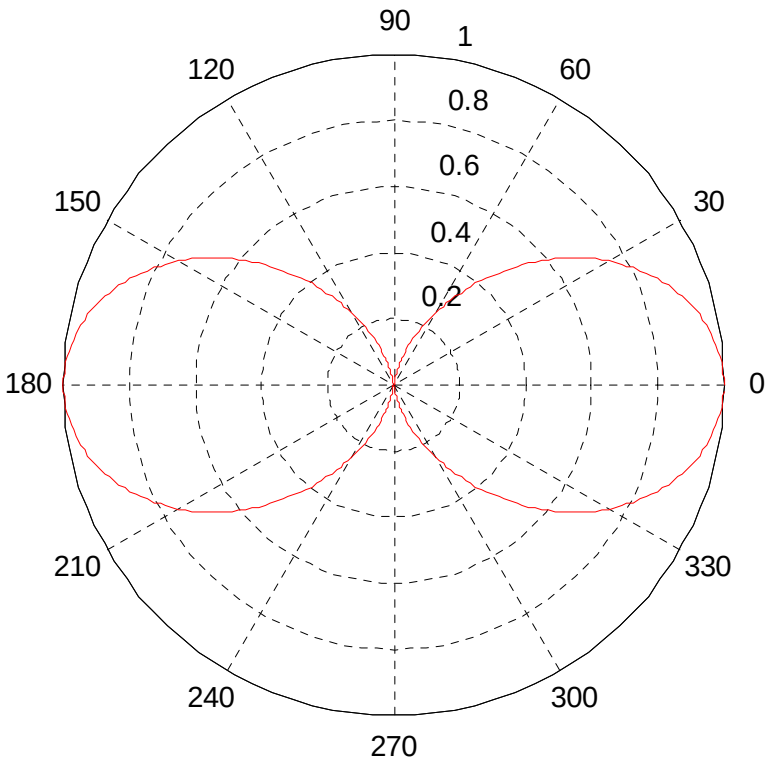
>> help polar

POLAR Polar coordinate plot.
POLAR(THETA, RHO) makes a plot using polar coordinates of
the angle THETA, in radians, versus the radius RHO.
POLAR(THETA,RHO,S) uses the linestyle specified in string S.
See PLOT for a description of legal linestyles.

See also PLOT, LOGLOG, SEMILOGX, SEMILOGY.

Example: (From MATLAB Command Window)

```
>> ang1 = 0:1:359;                                  % angles in degrees
>> rho1 = cos(ang1*pi/180).*cos(ang1*pi/180);  % radial values
>> polar(ang1*pi/180,rho1,'r-')              % plot (converted angles to radians)
```



Notes: These plots are strictly linear and radial values must be positive.

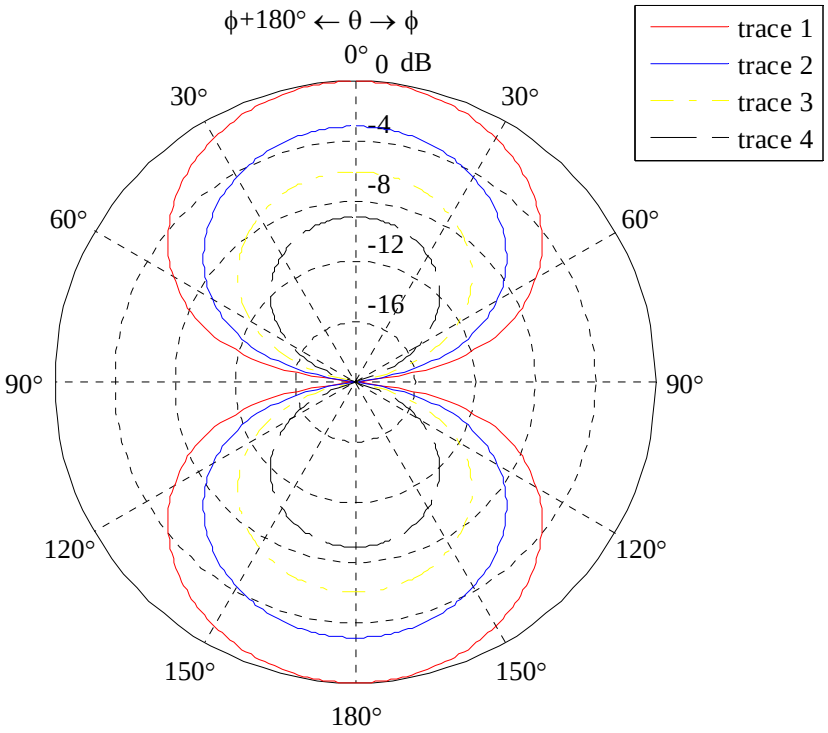
radpat.m found on course webpage:

```
function radpat(ang1,R1,st1,ang2,R2,st2,ang3,R3,st3,ang4,R4,st4)
%RADPAT  Polar coordinate plot used for antenna radiation patterns.
%      RADPAT(ANG1,R1,ST1,ANG2,R2,ST2,ANG3,R3,ST3,ANG4,R4,ST4)
%       plots up to four curves in dB format.
%
%      ANGi are angles in degrees,
%      Ri are radiation pattern values (radii for plot traces), &
%      STi are the linestyles.
%      See PLOT for a description of legal linestyles.
%      Ri can be in dB or not in dB (resulting plot is in dB).
%      Axis labels can be placed on horizontal or vertical axis.
%      Choice of normalized or unnormalized (show gains) patterns.
%      Minimum dB level at plot center can be specified.
%      Max dB level at outermost plot circle can be specified for unnormalized patterns.
%      Line width of radiation patterns can be specified.
%      Legend can be placed. To move the legend, press left mouse button on the legend
%       and drag to the desired location.
%      Grid linetype can be specified.
%      Default values are inside [], press Enter to chose default.
%      0 degrees can be at North/Top or East/Right side of plot.
%      Example:  radpat(a1,r1,'r-',a2,r2,'y--')
%
%        Based on polarpat.m by D. Liu, 9/13/1996.
%        T.J. Watson Research center, IBM
%        P.O.Box 218
%        Yorktown Heights, NY 10598
%        Email: dliu@watson.ibm.com
%
%        Updated by Thomas P. Montoya, SDSM&T, 1/23/2006
%        * allow up to four traces
%        * added degree symbols to plot spoke labels
%        * for plots vs. theta keep spoke labels in 0 to +180 deg range and
%          indicate that negative theta angles are for phi+180 deg and
%        * orient plot so that 0 degrees at the top (North)
```

Note: The resulting radiation pattern plot is in dB regardless of whether the input variable(s) (e.g., rho1) is originally in dB or not.

Example: (From MATLAB Command Window)

```
>> ang = 0:1:359;                                  % Define angles in degrees
>> rho1 = cos(ang1*pi/180).*cos(ang1*pi/180);      % Define radiation patterns
>> rho2 = 0.5*rho1;
>> rho3 = 0.5*rho2;
>> rho4 = 0.5*rho3;
>> radpat(ang,rho1,'r-',ang,rho2,'b-',ang,rho3,'y-.',ang,rho4,'k--')
Are input values in dB (Y/N)[Y]? n
Normalize to the Maximum Gain Value (Y/N)[Y]? y
Minimum dB value at plot center [-40]? -20
Are the angles theta values? (Y/N)[Y]? y
Labels on Vertical or Horizontal axis (V/H)[V]? v
Pattern line width [1.25]:
Legend for traces on graph (Y/N)[N]? y
Enter label for trace 1: trace 1
Enter label for trace 2: trace 2
Enter label for trace 3: trace 3
Enter label for trace 4: trace 4
Put a box around the legend (Y/N)[Y]?
Line type of grid(-, --, -., :)[:]?
```



Notes: You may need to move labels around on the MATLAB figure window using the mouse (click arrow icon, then left click and drag with mouse).

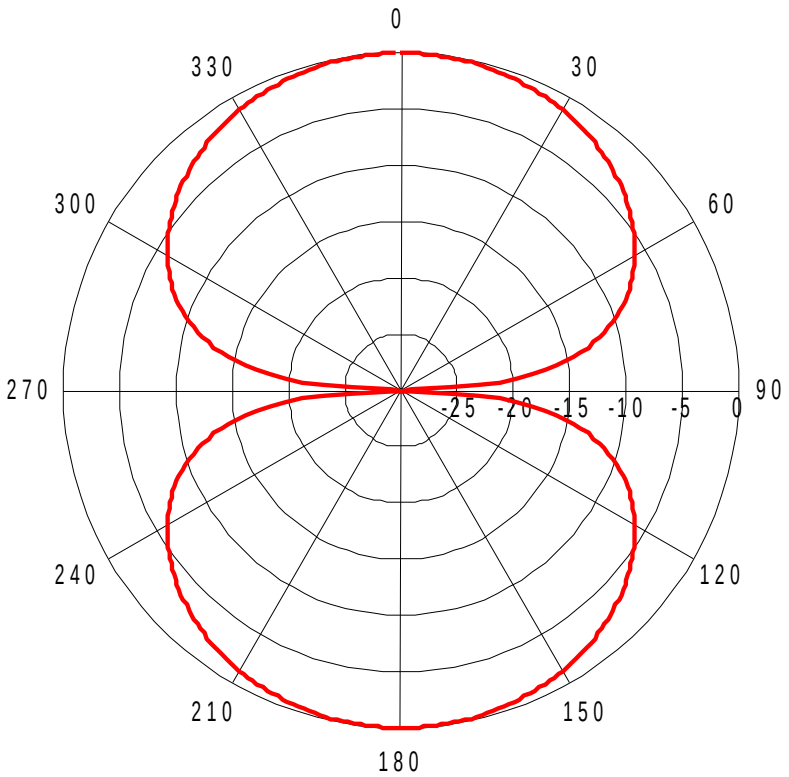
polarpat.m found on internet & course webpage:

```
function polarpat(ang1,rho1,st1,ang2,rho2,st2,ang3,rho3,st3)
% POLARPAT  Polar coordinate plot used for antenna radiation patterns.
%       POLARPAT(ANG1,RHO1,ST1,ANG2,RHO2,ST2,ANG3,RHO3,ST3) plots up
to
%       three curves. ANGi is angles in degress, RHOi is radius, and
%       STi is linestyle.
%       RHOi can be in dB or not in dB.
%       Axis labels can be placed horzontally or vertically.
%       Choice of normalized or unnormalized (showing gains) patterns.
%       Minimum level at the polar center can be specified.
%       Maximum level at the polar outmost circle can be specified for
%         unnormalized patterns.
%       Line width of radiation patternns can be specified.
%       Legend can be placed. To move the legend, press the left mouse
%         button on the legend and drag to the desired location.
%       Grid linetypes can be specified.
%       Default value is inside [], press Enter to chose default.
%       See PLOT for a description of legal linestyles.
%       0 degree can be in the East or North direction.
%       Example:  polarpat(a1,r1,'r-',a2,r2,'y--')
%       Written by Duixian Liu, on September 13, 1996.
%       T.J. Watson Research center
%       IBM
%       P.O.Box 218
%       Yorktown Heights, NY 10598
%       Email: dliu@watson.ibm.com
…
```

Note: The resulting radiation pattern plot is in dB regardless of whether the input variable(s) (e.g., rho1) is originally in dB or not.

Example: **(From MATLAB Command Window)**

```
>> ang1 = 0:1:359;          % define angles in degrees
>> rho1 = cos(ang1*pi/180).*cos(ang1*pi/180);
>> polarpat(ang1,rho1,'r-')
Are input values in dB (Y/N)[Y]? N
Normalize to the Maximum Gain Value (Y/N)[Y]? Y
The minimum dB value at polar center [-50]? -30
Put axis label Vertically or Horizontally (V/H)[H]?
Pattern line width [1.0]: 1
Is 0 degree in the North or East (N/E)[E]? N
Line type of grid(-, --, -., :)[-]? -
>>
```



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