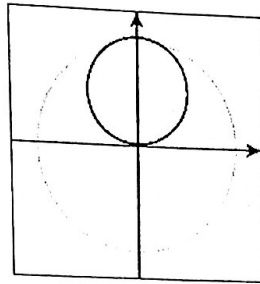


$r = a$
Circle

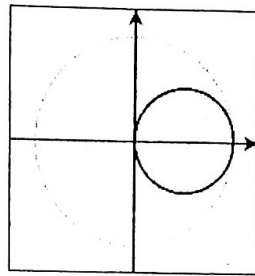
center at the pole
radius = a



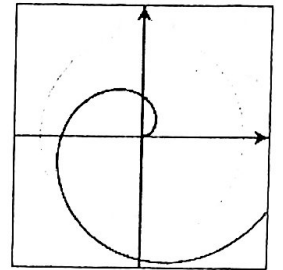
$r = a \sin \theta$

Circles not centered at the pole
 a is the diameter

sine curves are symmetric to y-axis cosine curves are symmetric to x-axis



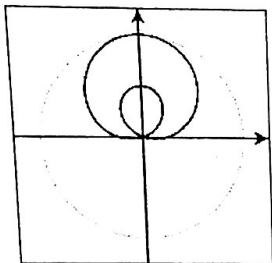
$r = a \cos \theta$



$r = a \theta$

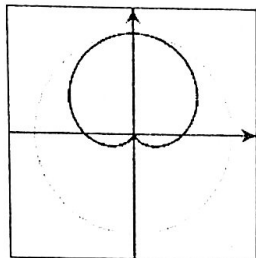
Spiral of Archimedes
 a controls the width
(must be in radian mode)

Limaçons are in the form $r = a \pm b \sin \theta$ (symmetric to y-axis) or $r = a \pm b \cos \theta$ (symmetric to x-axis)



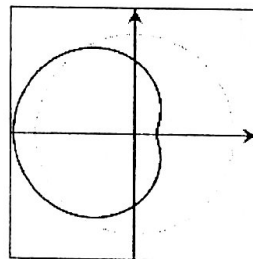
$a < b$

Limaçon with inner loop



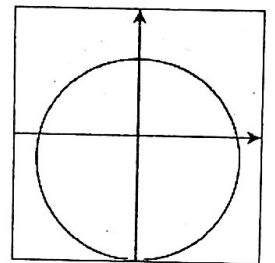
$a = b$

Cardioid
(heart shaped)



$b < a < 2b$

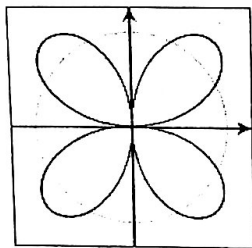
Dimpled Limaçon



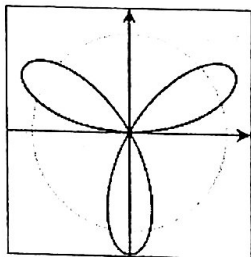
$a \geq 2b$

Convex Limaçon
(one side is flattened)

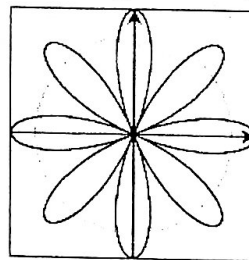
Rose curves are in the form $r = a \cdot \sin(n\theta)$ or $r = a \cdot \cos(n\theta)$. The maximum diameter of a petal is controlled by a . If n is even, the rose curve will have $2n$ petals. If n is odd, the rose curve will have n petals. Interesting patterns can be formed if n is a decimal and the curve is viewed with θ starting at 0 and going out to very large numbers.



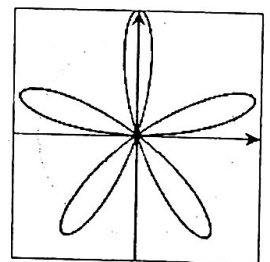
$r = a \cdot \sin(2\theta)$



$r = a \cdot \sin(3\theta)$



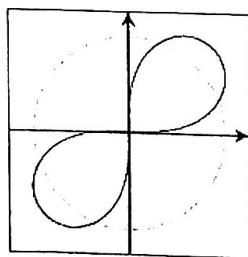
$r = a \cdot \cos(4\theta)$



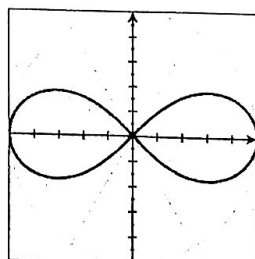
$r = a \cdot \sin(5\theta)$

Lemniscates look like infinity signs and are in the form $r^2 = a^2 \cdot \sin(2\theta)$ and $r^2 = a^2 \cdot \cos(2\theta)$
[symmetric to the origin] [symmetric to the x-axis]

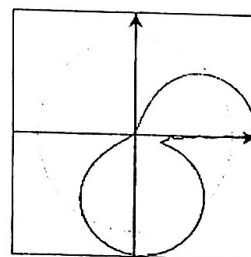
If the coefficient of θ is a number other than 1 or 2, a deformed lemniscates will result.



$r^2 = a^2 \cdot \sin(2\theta)$



$r^2 = a^2 \cdot \cos(2\theta)$



$r^2 = a^2 \cdot \cos(1.3\theta)$

Match the polar equations with their graphs below.

E 1) $r = 3 - \cos\theta$

I 5) $r = 3 + 1.5\sin\theta$

A 9) $r = 2 - 3\cos\theta$

D 2) $r = 2 - 2\sin\theta$

L 6) $r = 3.5\cos(2\theta)$

H 10) $r = 3\cos(4\theta)$

F 3) $r = 5\cos(3\theta)$

G 7) $r = 5\sin(3\theta)$

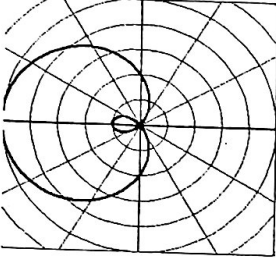
L 11) $r = -4\cos\theta$

B 4) $r = 2 - 2\cos\theta$

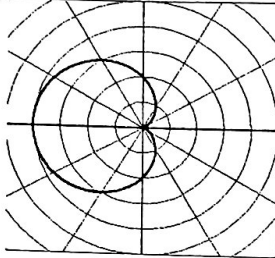
J 8) $r^2 = -16\cos(2\theta)$

K 12) $r = 3.5\sin(2\theta)$

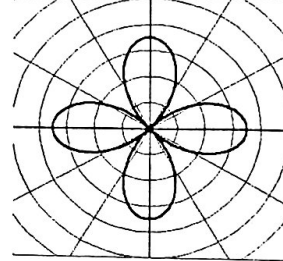
A.



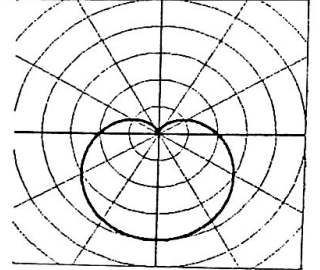
B.



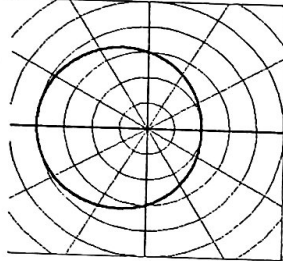
e.



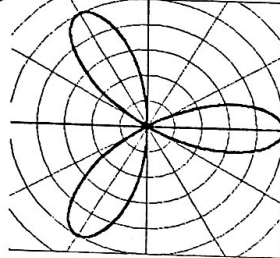
B.



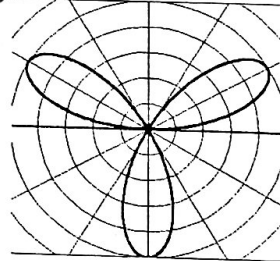
E.



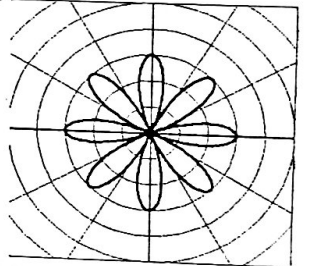
F.



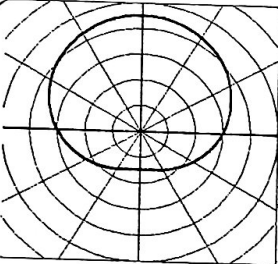
G.



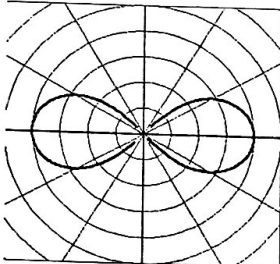
H.



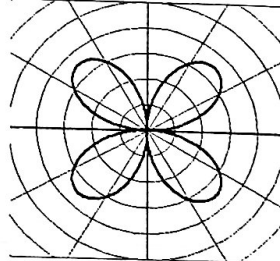
I.



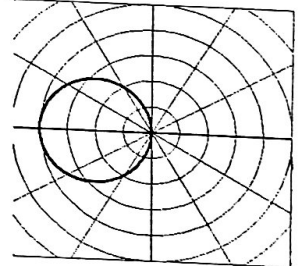
J.



K.



L.



Graphs of Polar Equations

Match each polar equation with its graph! Identify any key features of the graphs that you use to make your decisions.

(1) $r = 3 \cos \theta$ **J**

(2) $r = 3 \cos 5\theta$ **A**

(3) $r = 6 \cos 5\theta$ **D**

(4) $r = 3 \sin 5\theta$ **C**

(5) $r = 3 \sin 7\theta$ **F**

(6) $r = 4 \cos \theta - 2$ **K**

(7) $r = 3 \cos \theta - 3$ **B**

(8) $r = 3 \sin \theta + 3$ **G**

(9) $r = 4 \sin \theta - 2$ **M**

(10) $r = \frac{\theta}{2}$ **N**

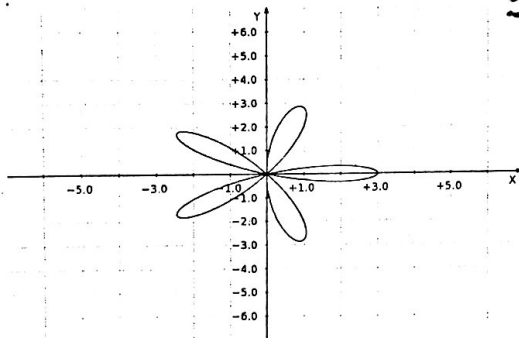
(11) $r = -\frac{\theta}{2}$ **J**

(12) $r = 5 \sin \frac{3}{4}\theta$ **E**

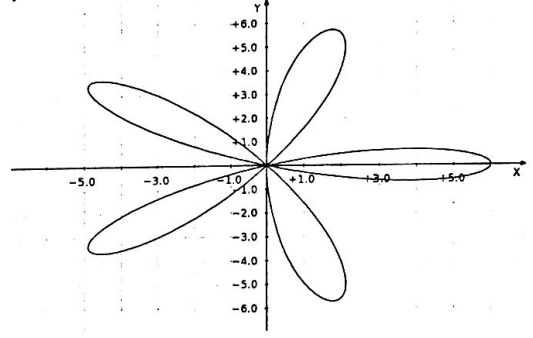
(13) $r = 4 \cos 2\theta$ **H**

(14) $r = 4 \sin 2\theta$ **L**

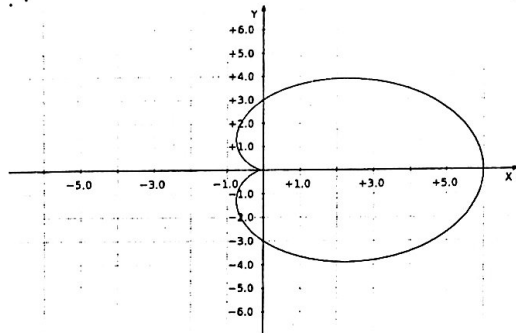
A. 2



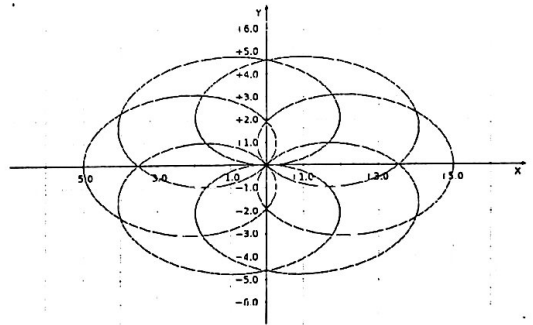
3D.



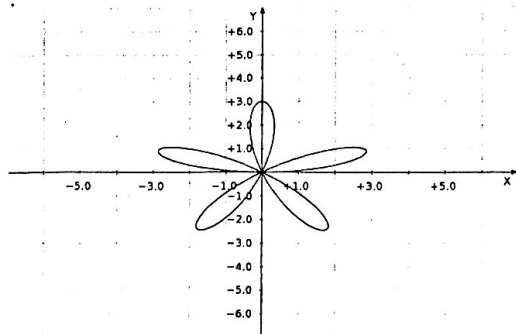
B. 7



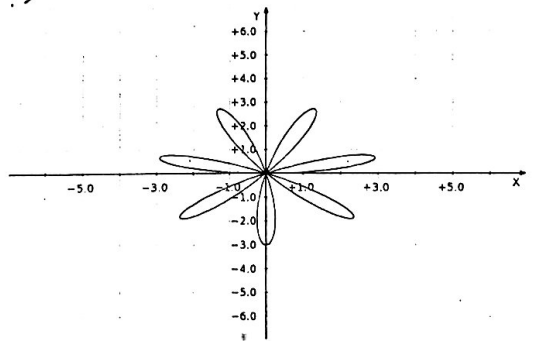
12E.



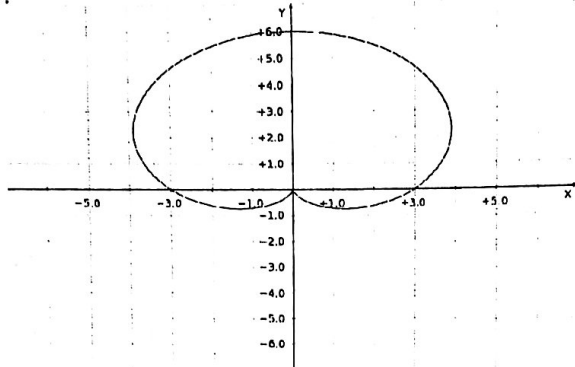
4C.



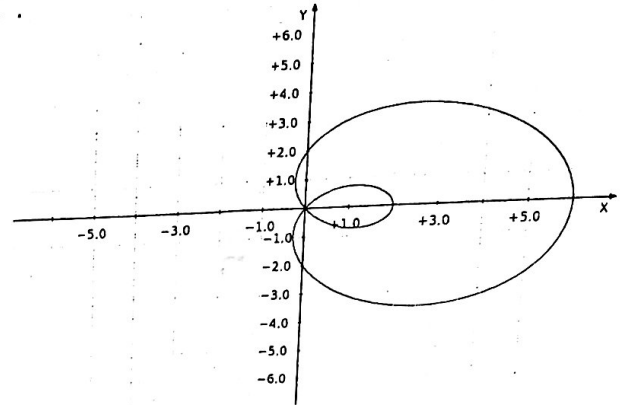
F. 5



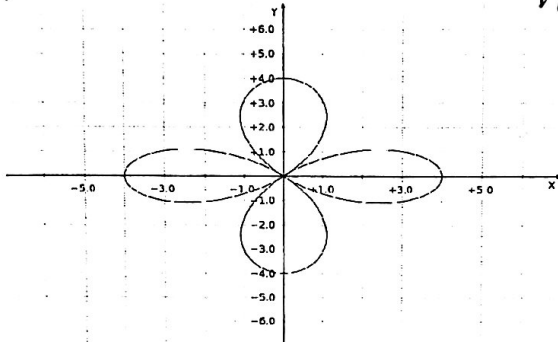
8G.



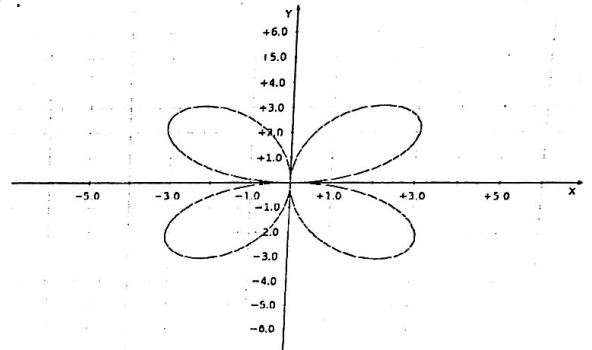
6K.



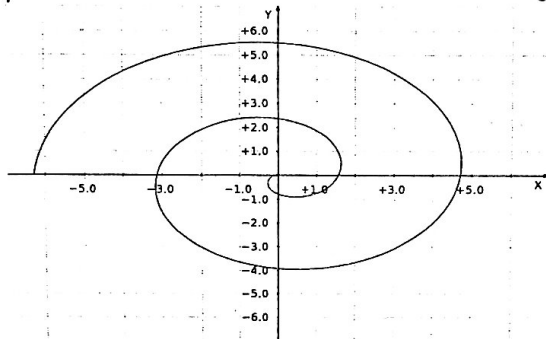
13H.



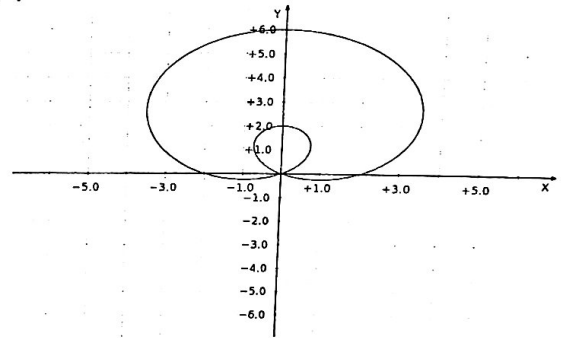
14L.



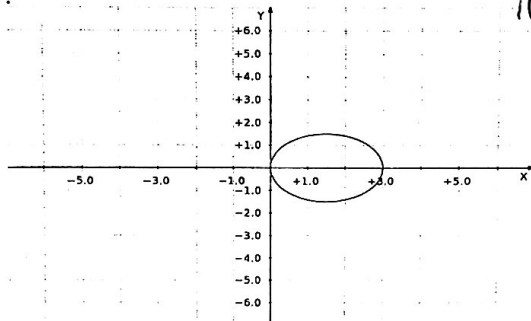
11I.



9M.



1J.



10N.

