

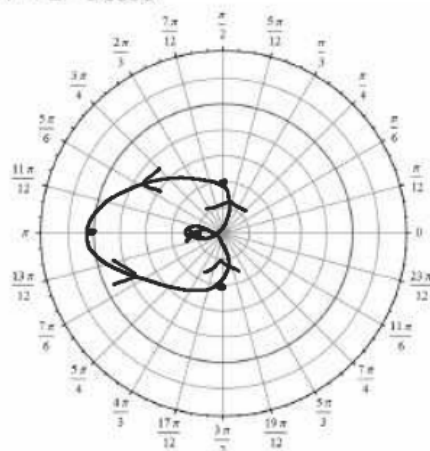
| θ | r |
|----------|-----|
| 0 | -1 |
| 90° | 2 |
| 180 | 5 |
| 270 | 2 |

(-1,0)

Graph the following polar curve:

$$r = 2 - 3\cos\theta$$

$$2 - 3(-1) = 2 + 3$$



1. What is the value of r when $\theta = 0$?
2. What is the value of θ when $r = 0$?
3. What is the value of θ when $\theta = \frac{\pi}{2}$?

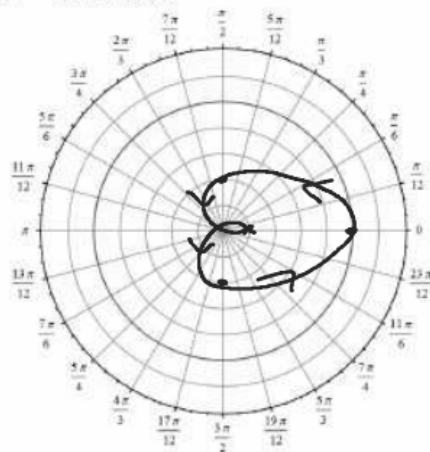
$$(1,0)$$

| θ | r |
|----------|-----|
| 0 | 1 |
| 90 | -2 |
| 180 | -5 |
| 270 | -2 |

(-2, 90)
(-5, 180)

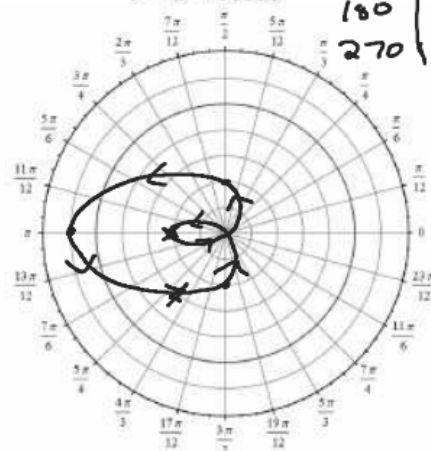
Graph the following polar curve:

$$r = -2 + 3\cos\theta$$



$$2 - 4(-1) = 2 - (-4)$$

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



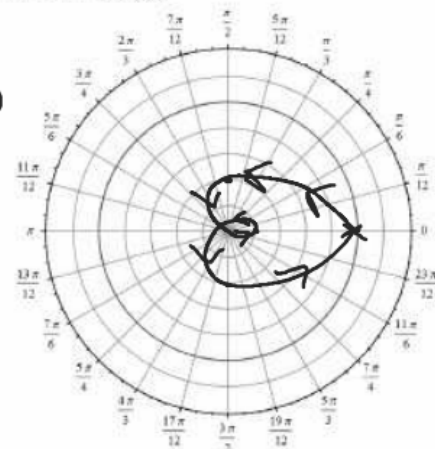
1. What is the value of r when $\theta = 0$?
2. What is the value of θ when $r = 0$?
3. What is the value of θ when $\theta = \frac{\pi}{2}$?

| θ | r |
|----------|-----|
| 0 | -2 |
| 90° | 2 |
| 180 | 6 |
| 270 | 2 |

| θ | r |
|----------|--------------|
| 0 | 5 (sp) |
| 90 | 2 |
| 180 | -1 (-1, 180) |
| 270 | |

Graph the following polar curve:

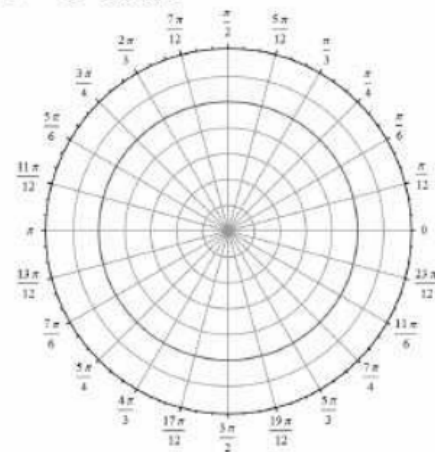
$$r = 2 + 3\cos\theta$$



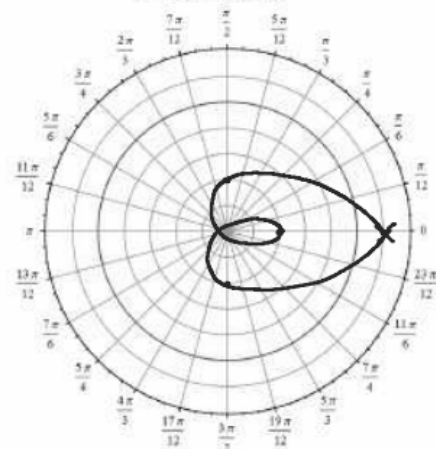
1. What is the value of r when $\theta = 0$?
2. What is the value of θ when $r = 0$?
3. What is the value of θ when $\theta = \frac{\pi}{2}$?

Graph the following polar curve:

$$r = -2 - 3\cos\theta$$

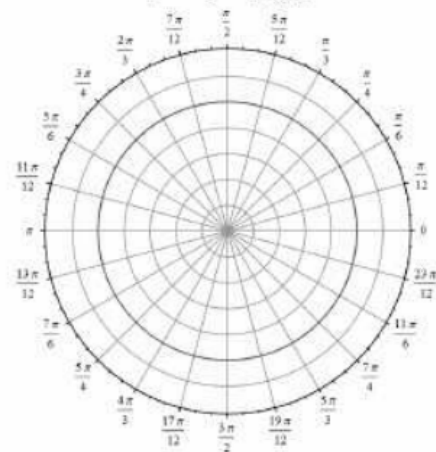


$$r = 2 + 4\cos\theta$$



1. What is the value of r when $\theta = 0$?
2. What is the value of θ when $r = 0$?
3. What is the value of θ when $\theta = \frac{\pi}{2}$?

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

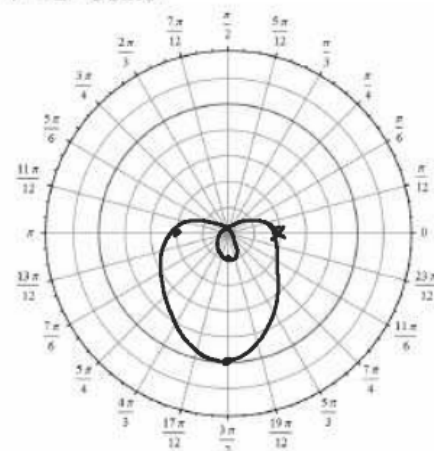


2-(-3)

| θ | r |
|----------|---------|
| 0 | 2 (2,0) |
| 90 | -1 |
| 180 | 2 |
| 270 | 5 |

Graph the following polar curve:

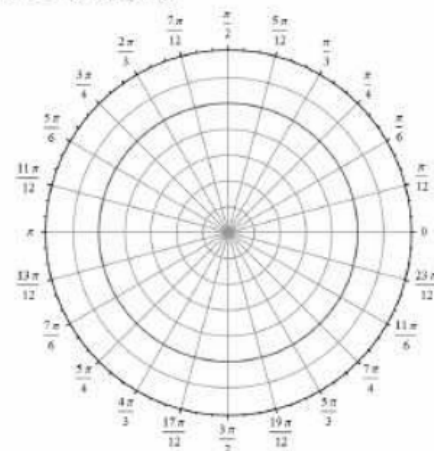
$$r = 2 - 3\sin\theta$$



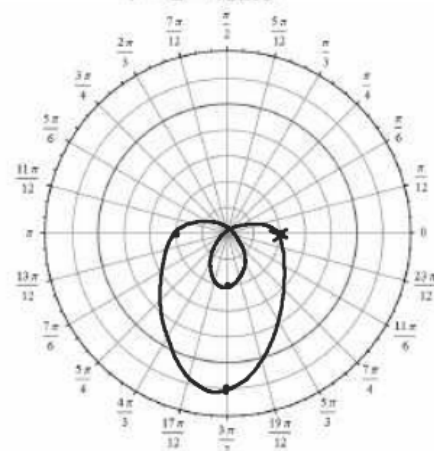
1. What is the value of r when $\theta = 0$?
2. What is the value of θ when $r = 0$?
3. What is the value of θ when $\theta = \frac{\pi}{2}$?

Graph the following polar curve:

$$r = -2 + 3\sin\theta$$

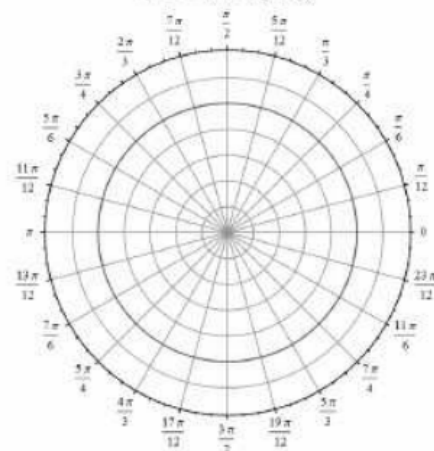


$$r = 2 - 4\sin\theta$$



1. What is the value of r when $\theta = 0$?
2. What is the value of θ when $r = 0$?
3. What is the value of θ when $\theta = \frac{\pi}{2}$?

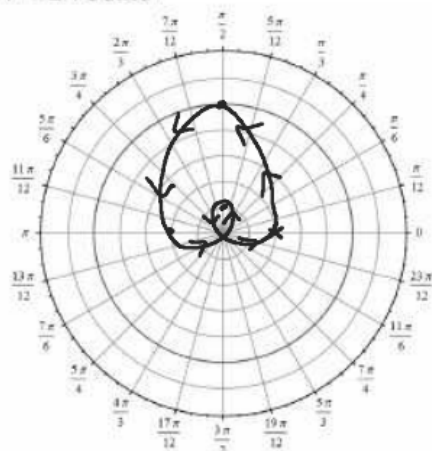
$$r = -2 + 4\sin\theta$$



| θ | r |
|----------|-----|
| 0 | 2 |
| 90 | 5 |
| 180 | 2 |
| 270 | -1 |

Graph the following polar curve:

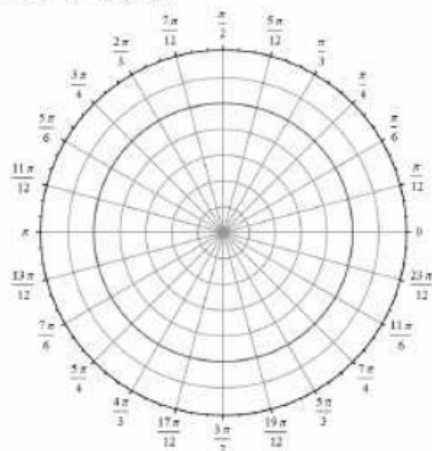
$$r = 2 + 3\sin\theta$$



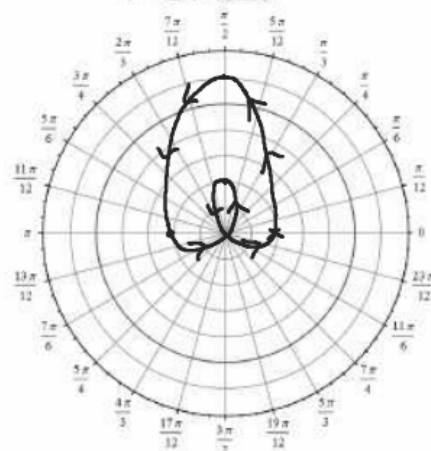
1. What is the value of r when $\theta = 0$?
2. What is the value of θ when $r = 0$?
3. What is the value of θ when $\theta = \frac{\pi}{2}$?

Graph the following polar curve:

$$r = -2 - 3\sin\theta$$

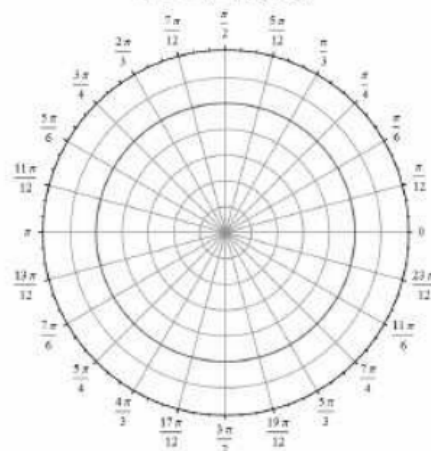


$$r = 2 + 4\sin\theta$$



1. What is the value of r when $\theta = 0$?
2. What is the value of θ when $r = 0$?
3. What is the value of θ when $\theta = \frac{\pi}{2}$?

$$r = -2 - 4\sin\theta$$



Summary of the Limacon: $r = \pm a \pm b \cos \theta$

- For a polar equation to be considered a Limacon with a loop, the value $|a|$ must be smaller than $|b|$.
- Plug in $\theta = 0$. This will give you the value of r and where you will start the curve moving counterclockwise back to the pole.
- The value of a will tell you where the curve is at on the y-axis (when $\theta = \frac{\pi}{2}$ and $\theta = \frac{3\pi}{2}$)
- To complete the entire shape $0 \leq \theta \leq 2\pi$.
- The value of $|a| + |b|$ will tell you how far out on the x-axis the curve is
- The value of $|a| - |b|$ will tell you how far out on the x-axis the loop is
- If b is negative the curve and the loop will be on the left side of the pole
- If b is positive the curve and the loop will be on the right side of the pole

Summary of the Limacon: $r = \pm a \pm b \sin \theta$

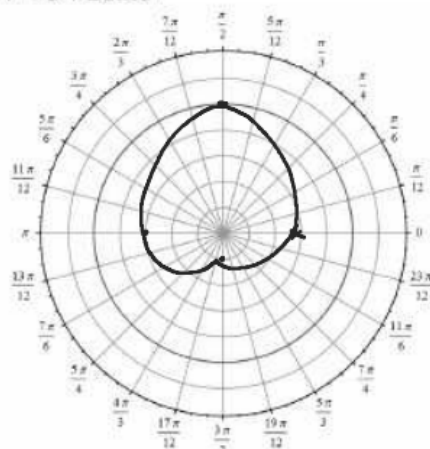
- For a polar equation to be considered a Limacon with a loop, the value $|a|$ must be smaller than $|b|$.
- Plug in $\theta = 0$. This will give you the value of r and where you will start the curve moving counterclockwise back to the pole.
- The value of a will tell you where the curve is at on the x-axis (when $\theta = 0$ and $\theta = \pi$)
- To complete the entire shape $0 \leq \theta \leq 2\pi$.
- The value of $|a| + |b|$ will tell you how far out on the y-axis the curve is
- The value of $|a| - |b|$ will tell you how far out on the y-axis the loop is
- If b is negative the curve and the loop will be below the pole
- If b is positive the curve and the loop will be above the pole

Dimple Limacon

| θ | r |
|----------|-----|
| 0 | 3 |
| 90 | 5 |
| 180 | 3 |
| 270 | 1 |

Graph the following polar curve:

$$r = 3 + 2\sin\theta$$



1. What is the value of r when $\theta = 0$?

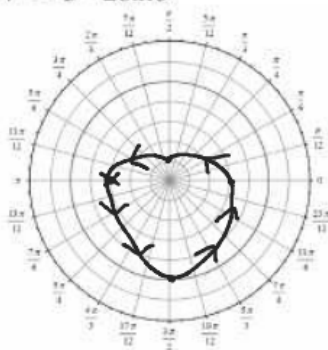
2. What is the value of r when $\theta = \pi$?

2. What is the value of θ when $r = 3$?

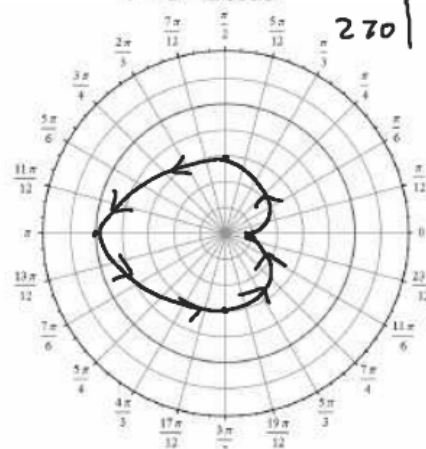
| θ | r |
|----------|-----|
| 0 | -3 |
| 90 | -5 |
| 180 | -3 |
| 270 | -1 |

Graph the following polar curve:

$$r = -3 - 2\sin\theta$$



$$r = 3 - 2\cos\theta$$

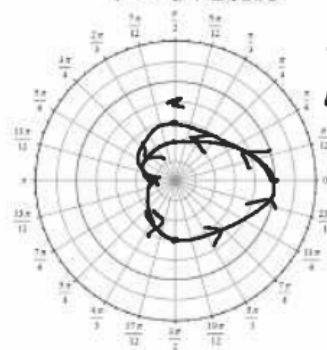


1. What is the value of r when $\theta = 0$?

2. What is the value of r when $\theta = \pi$?

2. What is the value of θ when $r = 3$?

$$r = -3 + 2\cos\theta$$



| θ | r |
|----------|-----|
| 0 | -1 |
| 90 | -3 |
| 180 | -5 |
| 270 | -3 |

Summary of the Dimpled Limacon: $r = \pm a \pm b \cos \theta$

- For a polar equation to be considered a Dimpled Limacon, the value $|a|$ must be larger than $|b|$.
- Plug in $\theta = 0$. This will give you the value of r and where you will start the curve moving counterclockwise.
- There will be no value at the pole.
- The value of a will tell you where the curve is at on the y-axis (when $\theta = \frac{\pi}{2}$ and $\theta = \frac{3\pi}{2}$)
- To complete the entire shape $0 \leq \theta \leq 2\pi$.
- The value of $|a| + |b|$ will tell you how far out to the right on the x-axis the curve is if cosine is positive
- The value of $|a| + |b|$ will tell you how far out to the left on the x-axis the curve is if cosine is negative
- The value of $|a| - |b|$ will tell you how far out on the left of the x-axis the curve is if cosine is positive
- The value of $|a| - |b|$ will tell you how far out on the right of the x-axis the curve is if cosine is negative

Summary of the Limacon: $r = \pm a \pm b \sin \theta$

- For a polar equation to be considered a Dimpled Limacon, the value $|a|$ must be larger than $|b|$.
- Plug in $\theta = 0$. This will give you the value of r and where you will start the curve moving counterclockwise.
- There will be no value at the pole.
- The value of a will tell you where the curve is at on the x-axis (when $\theta = 0$ and $\theta = \pi$)
- To complete the entire shape $0 \leq \theta \leq 2\pi$.
- The value of $|a| + |b|$ will tell you how far up on the y-axis the curve is if sine is positive
- The value of $|a| + |b|$ will tell you how far up on the y-axis the curve is if sine is negative
- The value of $|a| - |b|$ will tell you how far down on the y-axis the curve is if sine is positive
- The value of $|a| - |b|$ will tell you how far up on the y-axis the curve is if sine is negative