

شكراً لتحميلك هذا الملف من موقع المناهج الإماراتية



## شرح الدرس الأول Coordinates Polar الإحداثيات القطبية من الوحدة الثامنة

[موقع المناهج](#) ⇨ [المناهج الإماراتية](#) ⇨ [الصف الحادي عشر المتقدم](#) ⇨ [رياضيات](#) ⇨ [الفصل الثالث](#) ⇨ [الملف](#)

تاريخ نشر الملف على موقع المناهج: 09:37:36 2024-04-19

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## التواصل الاجتماعي بحسب الصف الحادي عشر المتقدم



[اضغط هنا للحصول على جميع روابط "الصف الحادي عشر المتقدم"](#)

## روابط مواد الصف الحادي عشر المتقدم على تلغرام

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## المزيد من الملفات بحسب الصف الحادي عشر المتقدم والمادة رياضيات في الفصل الثالث

[حل أسئلة الامتحان النهائي الالكتروني بريدج وريفيل](#)

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## المزيد من الملفات بحسب الصف الحادي عشر المتقدم والمادة رياضيات في الفصل الثالث

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# 8-1 Polar Coordinates

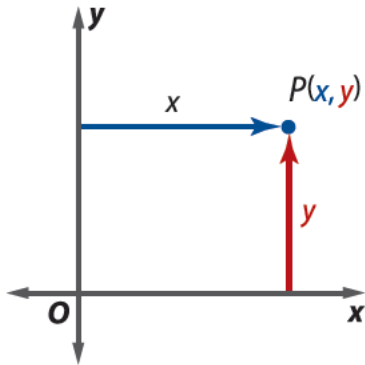


## Rectangular coordinates

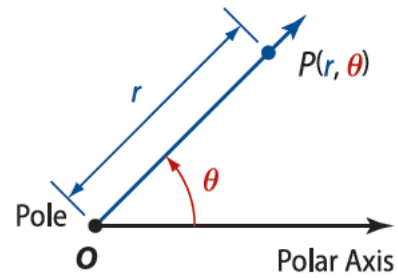
VS

## Polar coordinates

Rectangular Coordinate System

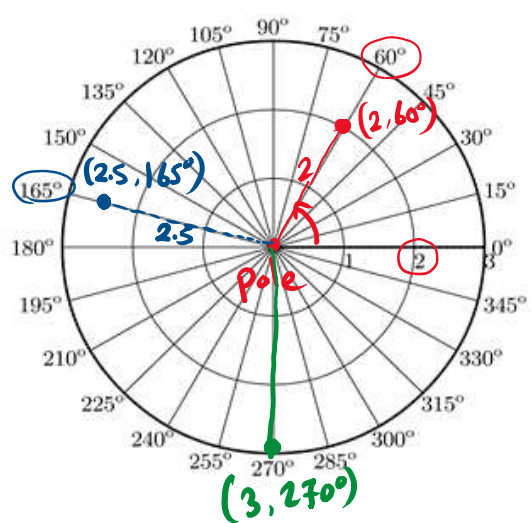
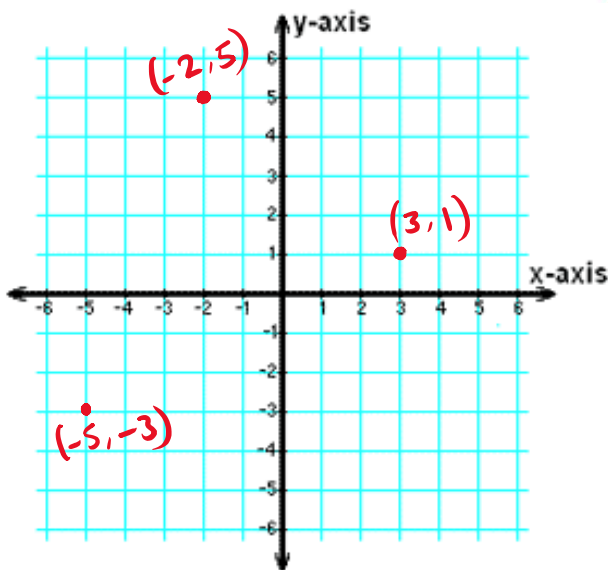


Polar Coordinate System



### Graphing Points in Polar Coordinates system:

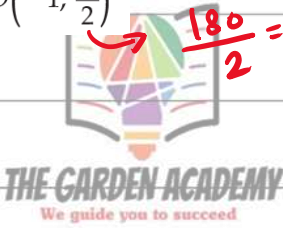
To graph a point given in polar coordinates, remember that a positive value of  $\theta$  indicates a counterclockwise rotation from the polar axis, while a negative value indicates a clockwise rotation. If  $r$  is positive, then  $P$  lies on the terminal side of  $\theta$ . If  $r$  is negative,  $P$  lies on the ray opposite the terminal side of  $\theta$ .



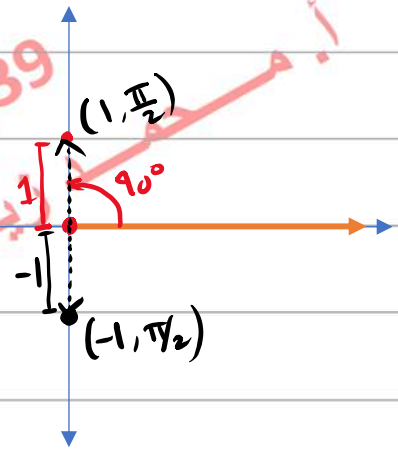
### Example 1 Graph Polar Coordinates

Graph each point.

1A.  $D\left(-1, \frac{\pi}{2}\right)$

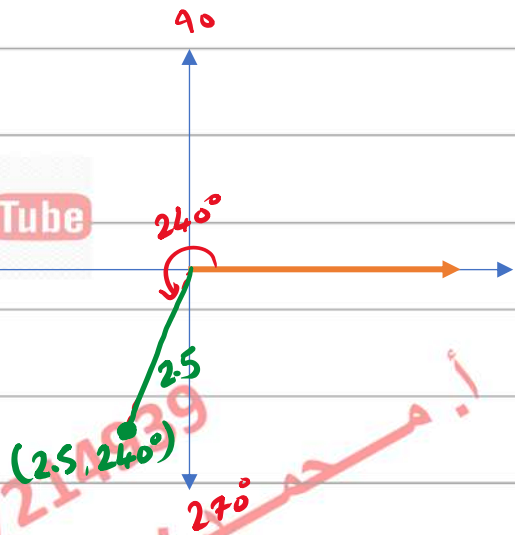
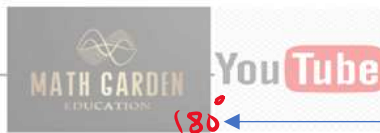


$\frac{180}{2} = 90^\circ$   
Counter Clockwise



1B.  $E(2.5, 240^\circ)$

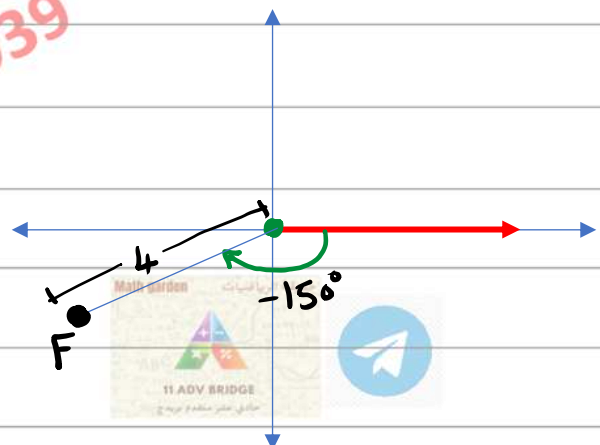
in  $Q_3$



1C.  $F\left(4, -\frac{5\pi}{6}\right)$

Clockwise

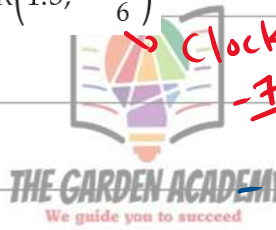
$-\frac{5}{6} \times 180 = -150^\circ$

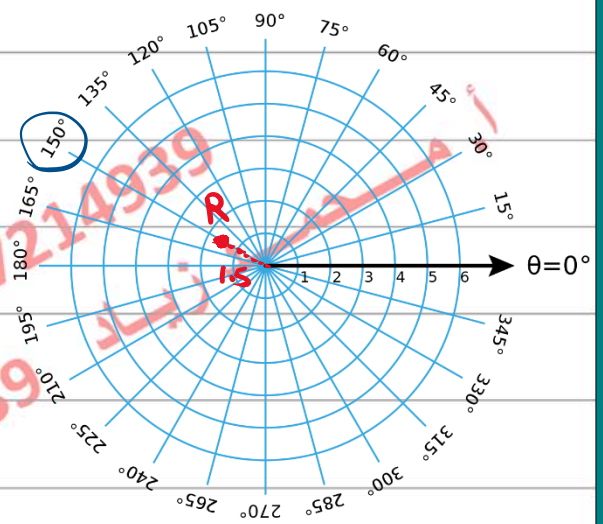


## Example 2 Graph Points on a Polar Grid

Graph each point on a polar grid.

2A.  $R\left(1.5, -\frac{7\pi}{6}\right)$


  
 Clockwise  
 $-\frac{7}{6} \times 180 = -210^\circ$   
 $-210 + 360 = 150^\circ$

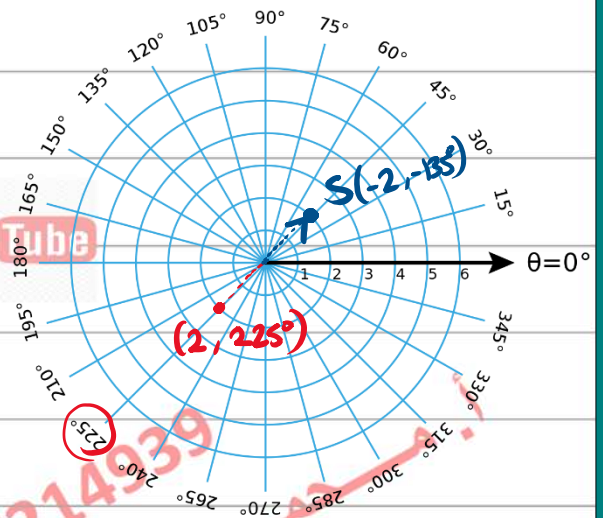


2B.  $S(-2, -135^\circ)$

Clockwise  
 $-135 + 360 = 225^\circ$   
 Reverse

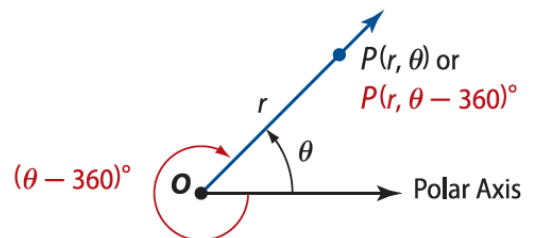
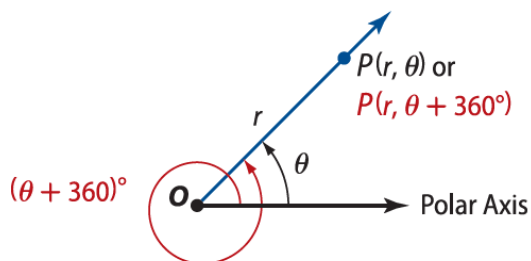


YouTube

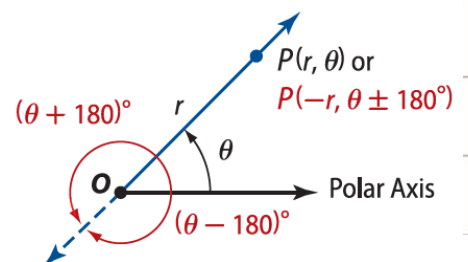


## Multiple Representations of Polar Coordinates

In a rectangular coordinate system, each point has a unique set of coordinates. This is *not* true in a polar coordinate system. In Lesson 4-2, you learned that a given angle has infinitely many coterminal angles. As a result, if a point has polar coordinates  $(r, \theta)$ , then it also has polar coordinates  $(r, \theta \pm 360^\circ)$  or  $(r, \theta \pm 2\pi)$  as shown.



Additionally, because  $r$  is a directed distance,  $(r, \theta)$  and  $(-r, \theta \pm 180^\circ)$  or  $(-r, \theta \pm \pi)$  represent the same point as shown.



### Example 3

Find three additional pairs of polar coordinates that name the given point if  $-360^\circ \leq \theta \leq 360^\circ$  or  $-2\pi \leq \theta \leq 2\pi$ .

3A.  $(5, 240^\circ)$

$240^\circ \xrightarrow{+180^\circ} 420^\circ > 360^\circ$   
 $240^\circ \xrightarrow{-180^\circ} 60^\circ$   
 $60^\circ \xrightarrow{-180^\circ} -120^\circ$   
 $-120^\circ \xrightarrow{-180^\circ} -300^\circ$

$(-5, 60^\circ)$   
 $(5, -120^\circ)$   
 $(-5, -300^\circ)$



3B.  $(2, \frac{\pi}{6})$

$(2, -\frac{11\pi}{6})$ ,  $(-2, -\frac{5\pi}{6})$ ,  $(2, \frac{\pi}{6})$ ,  $(-2, \frac{7\pi}{6})$ ,  $(2, \frac{13\pi}{6})$

$\frac{13\pi}{6} > 2\pi$   
 Not accepted

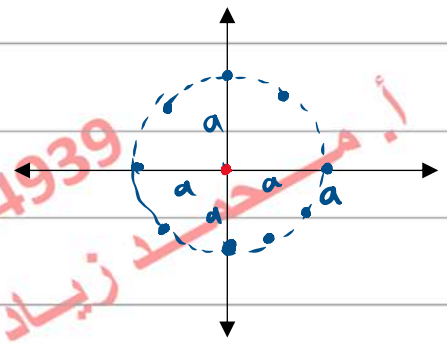


## Graphs of Polar Equations

1)  $r = a$

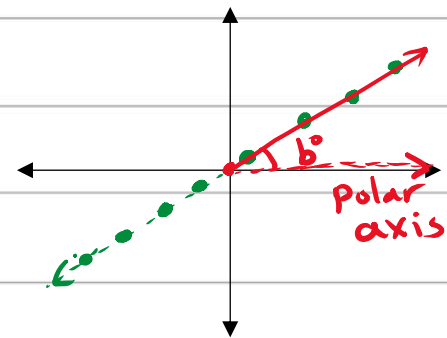
circle with radius  $|a|$

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We guide you to succeed



2)  $\theta = b^\circ$

straight line with angle  $b^\circ$  from the polar axis

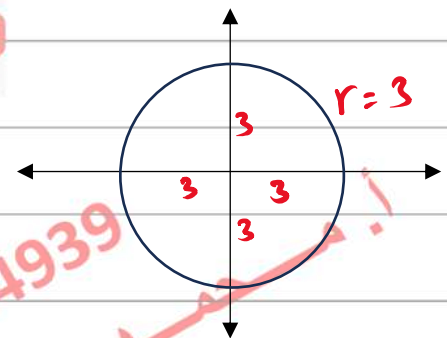


Ex: Graph each polar equation.

1)  $r = 3$



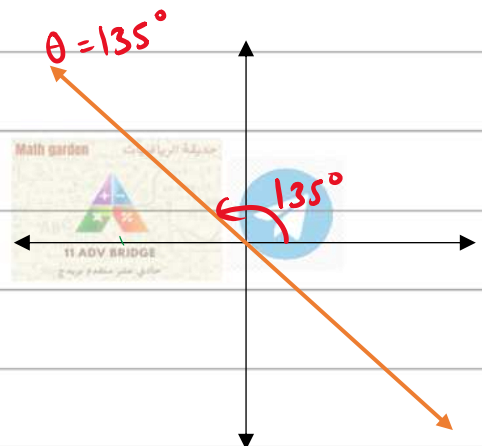
Circle with radius 3



2)  $\theta = 135^\circ$

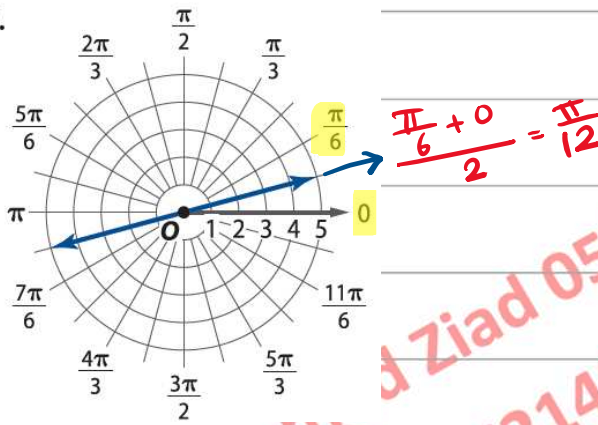
Q<sub>2</sub>

line with angle  $135^\circ$  counterclockwise from the polar axis



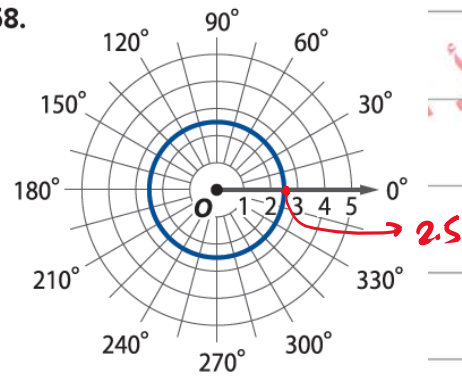
Write an equation for each polar graph.

57.



$$\theta = \frac{\pi}{12}$$

58.

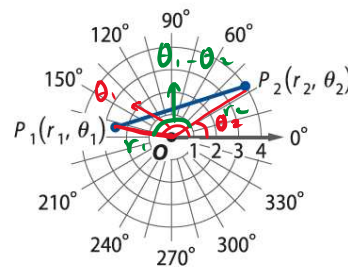


$$r = 2.5$$

### KeyConcept Polar Distance Formula

If  $P_1(r_1, \theta_1)$  and  $P_2(r_2, \theta_2)$  are two points in the polar plane, then the distance  $P_1P_2$  is given by

$$\sqrt{r_1^2 + r_2^2 - 2r_1r_2 \cos(\theta_2 - \theta_1)}$$



**Ex: AIR TRAFFIC** An air traffic controller is tracking two airplanes that are flying at the same altitude. The coordinates of the planes are  $A(5, 310^\circ)$  and  $B(6, 345^\circ)$ , where the directed distance is measured in kilometres.

Graph the points and find the distance between the planes

$$A(5, 310^\circ), B(6, 345^\circ)$$

$r_1 \quad \theta_1 \qquad r_2 \quad \theta_2$

$$d = \sqrt{r_1^2 + r_2^2 - 2r_1r_2 \cos(\theta_2 - \theta_1)}$$

$$= \sqrt{(5)^2 + (6)^2 - 2(5)(6) \cdot \cos(345^\circ - 310^\circ)}$$

$$= 3.44 \text{ km}$$

