Math 1432

www.math.uh.edu/~dlmus

9.8

40. $f(x)=e^{-2x}$ in powers of $(x+1)$

$x-(-1)$

cent. @ $x=-1$

$$\underbrace{e^x = 1 + x + \frac{x^2}{2!} + \cdots}_{\text{centered at } x=0}$$

K	$f^K(x)$	$f^K(-1)$	$\frac{f^K(-1)}{K!}$
0	e^{-2x}	e^2	e^2
1	$-2e^{-2x}$	$-2e^2$	$-2e^2$
2	$4e^{-2x}$	$4e^2$	$\frac{4e^2}{2!}$
3	$-8e^{-2x}$	$-8e^2$	$\frac{-8e^2}{3!}$
4	$16e^{-2x}$	$16e^2$	$\frac{16e^2}{4!}$

$$\sum_{K=0}^{\infty} \frac{2^K e^2}{K!} (-1)^K (x+1)^K$$

Public Page

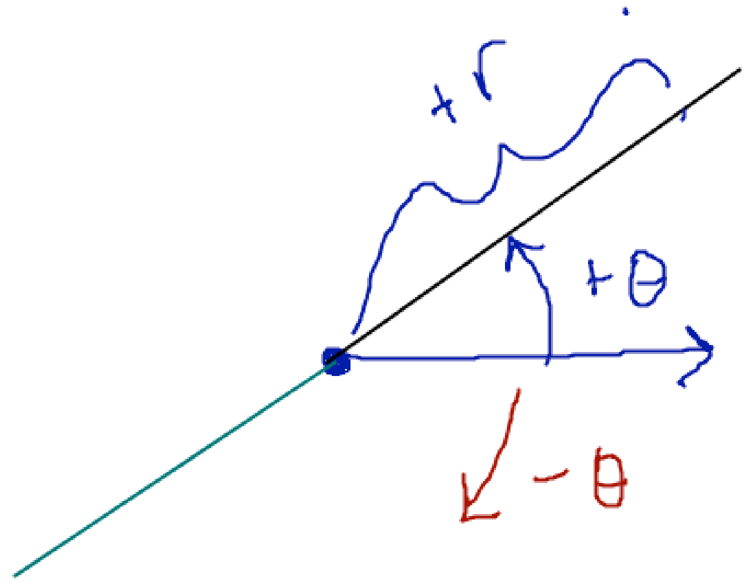
Ch 10 – Polar & Parametric

10.1 – Polar graphing

☆ $\left.\begin{aligned} x &= r\cos\theta \\ y &= r\sin\theta \end{aligned}\right\}$

$x^2+y^2=r^2$

$\left(\tan^{-1} y/x = \theta\right)$



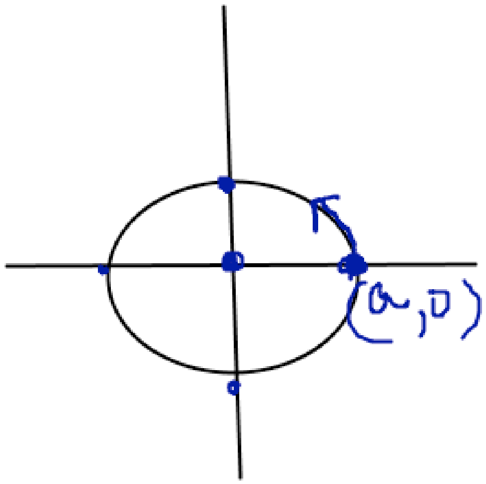
When plotting graph

start → 0

θ	r
0	___

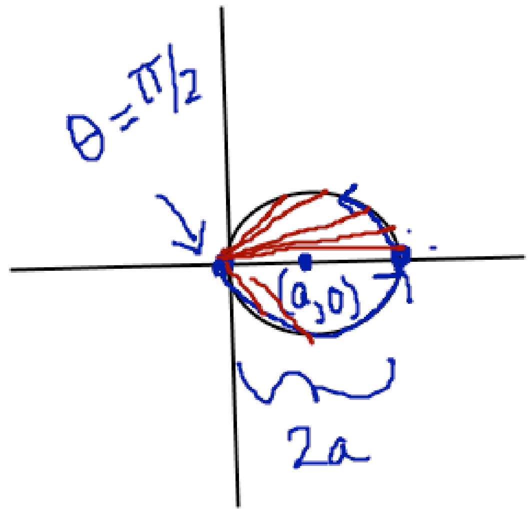
Circles

$r = a$



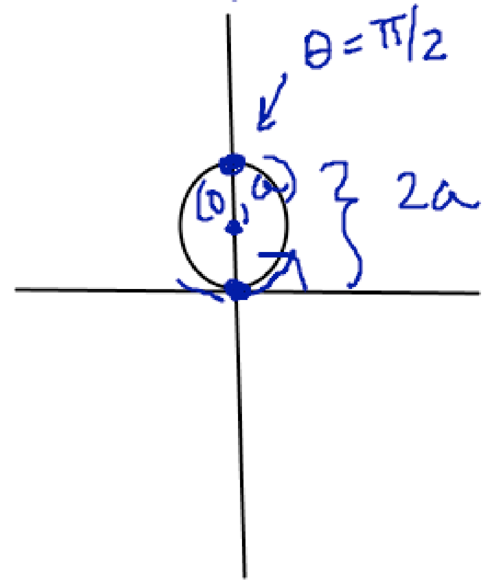
θ	r
start $\rightarrow 0$	a
$\pi/2$	a
finish $\rightarrow 2\pi$	a

$r = 2a\cos\theta$



θ	r
start $\rightarrow 0$	$2a$
$\pi/2$	0
finish $\rightarrow \pi$	$2a$

$r = 2a\sin\theta$



θ	r
0	0
$\pi/2$	$2a$
π	0

Flowers

$m > 1$ (integer)

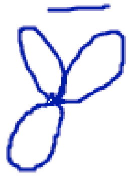
$r = a\cos(m\theta)$ ← always has a petal on x-axis

$r = a\sin(m\theta)$

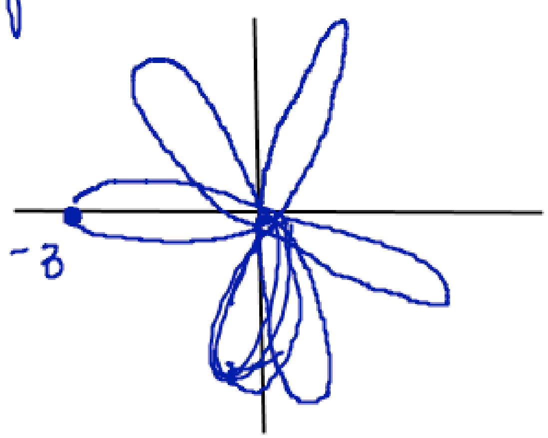
$|a|$ = length of petals

$$m = \begin{cases} m \text{ even} \rightarrow 2m \text{ petals} \\ m \text{ odd} \rightarrow m \text{ petals} \end{cases}$$

$r = -\underline{3}\cos(5\theta)$

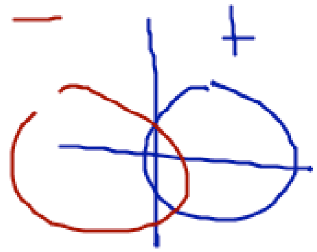


5 petals

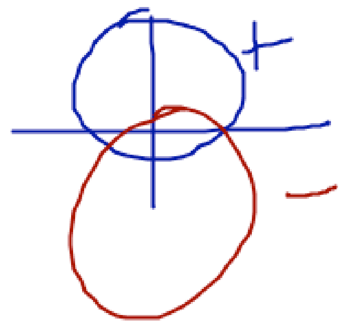


Limaçons

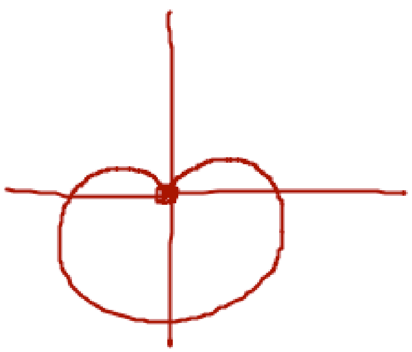
$r = a + b\cos\theta$



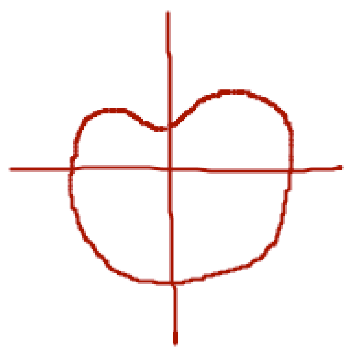
$r = a + b\sin\theta$



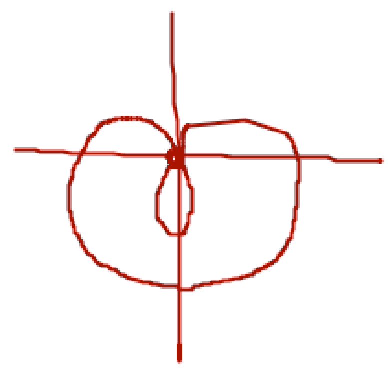
$|a| = |b|$
cardioid



$|a| > |b|$
dent



$|a| < |b|$
loop



Q21 #7

Assume that $f(x) = \ln(1+x)$ is the given function and that P_n represents the nth Taylor Polynomial centered at $x = 0$. Find the least integer n for which $P_n(0.5)$ approximates $\ln(1.5)$ to within 0.0001.

$$\ln(1.5) = \ln(1+.5) \qquad x = .5$$

$$f(x) = \ln(1+x)$$

$$f'(x) = \frac{1}{1+x}$$

$$f''(x) = \frac{-1}{(1+x)^2}$$

$$f'''(x) = \frac{-1 \cdot -2}{(1+x)^3}$$

$$f^{(4)}(x) = \frac{-1 \cdot -2 \cdot -3}{(1+x)^4}$$

$$\vdots$$

$$f^{(n)}(x) = \frac{(-1)^{n+1}(n-1)!}{(1+x)^n}$$

$$\left|f^{(n+1)}(x)\right| = \frac{n!}{(1+x)^{n+1}} \le n!$$

Something between 0 + .5

$$M = n!$$

$$\frac{n!}{(n+1)!} x^{n+1} < .0001$$

.5

PRINTABLE VERSION

Quiz 22

You scored 100 out of 100

Question 1

Your answer is CORRECT.

$r \quad \theta$

Find the rectangular coordinates for the point given in poloar coordinates: $\left[5, \frac{3\pi}{2}\right]$

$x = r\cos\theta, \quad y = r\sin\theta$

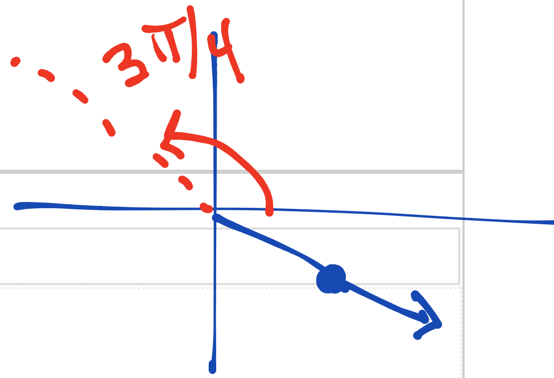
a) $(-1, -4)$

b) $(0, 5)$

c) $(0, -5)$

d) $(1, -5)$

e) $(-1, -6)$



Question 2

Your answer is CORRECT. x, y

Give all possible polar coordinates for the point $(1, -1)$ given in rectangular coordinates.

$x^2 + y^2 = r^2$

$1^2 + (-1)^2 = 2 = r^2 \quad \boxed{r = \sqrt{2}}$

a) $\left[-\sqrt{2}, \frac{7\pi}{4} + 2n\pi\right], \left[\sqrt{2}, \frac{3\pi}{4} + 2n\pi\right]$

b) $\left[2\sqrt{2}, \frac{7\pi}{4} + 2n\pi\right], \left[-2\sqrt{2}, \frac{3\pi}{4} + 2n\pi\right]$

c) $\left[\frac{\sqrt{2}}{2}, -\frac{7\pi}{4} + 2n\pi\right], \left[-\frac{\sqrt{2}}{2}, -\frac{3\pi}{4} + 2n\pi\right]$

d) $\left[\sqrt{2}, \frac{7\pi}{4} + 2n\pi\right], \left[-\sqrt{2}, \frac{3\pi}{4} + 2n\pi\right]$

e) $\left[\sqrt{2}, \frac{3\pi}{4} + 2n\pi\right], \left[-\sqrt{2}, \frac{7\pi}{4} + 2n\pi\right]$

$1 = \sqrt{2}\cos\theta \quad -1 = \sqrt{2}\sin\theta$

$\frac{1}{\sqrt{2}} = \cos\theta \quad -\frac{1}{\sqrt{2}} = \sin\theta$

$\boxed{\theta = \frac{7\pi}{4}}$ + mult of 2π

$-\sqrt{2}, 3\pi/4 +$ "

Question 3

Your answer is CORRECT.

Find the point symmetric to $\left[\frac{7}{2}, \frac{\pi}{6}\right]$ about the origin.

a) $\left[\frac{7}{2}, \frac{\pi}{6}\right]$

b) $\left[\frac{7}{2}, \frac{5\pi}{6}\right]$

c) $\left[\frac{7}{2}, \frac{2\pi}{3}\right]$

d) $\left[7, \frac{2\pi}{3}\right]$

e) $\left[\frac{7}{2}, \frac{7\pi}{6}\right]$

Question 4

Your answer is CORRECT.

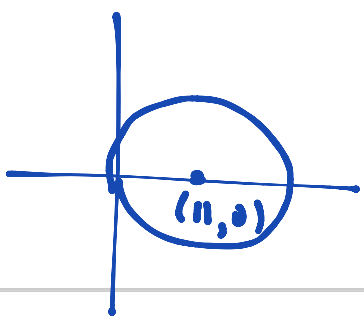
Write the equation $(x-11)^2 + y^2 = 121$ in polar coordinates.

$x^2 - 22x + 121 + y^2 = 121$

$x^2 + y^2 = 22x$

$r^2 = 22r\cos\theta$

$r = 22\cos\theta$



a) $r = 121$

b) $r = 22\sin(\theta)$

c) $r = 11\cos^2(\theta)\sin(\theta)$

d) $r = 22\cos(\theta)$

e) $r = 11\sin(\theta) + 121$

Question 5

Your answer is CORRECT.

Write the equation $2r\cos(\theta) = 9$ in rectangular coordinates.

a) $x^2 = 9$

b) $x = \frac{9}{2}$

c) $x = \frac{2}{9}$

d) $y = \frac{9}{2}$

e) $y = \frac{3}{2}$

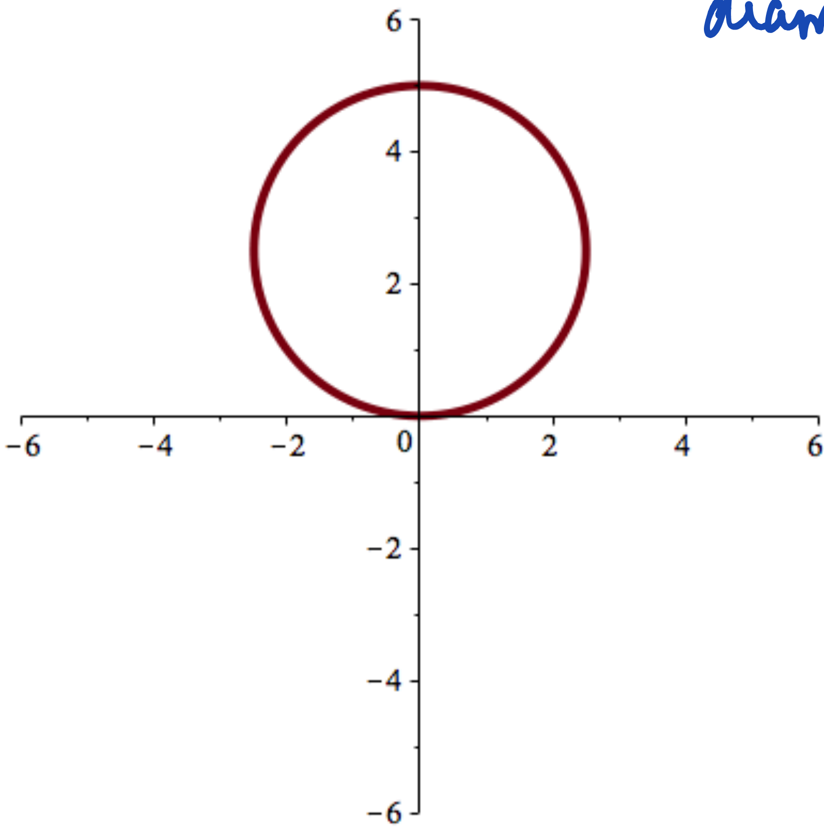
Question 6

Your answer is CORRECT.

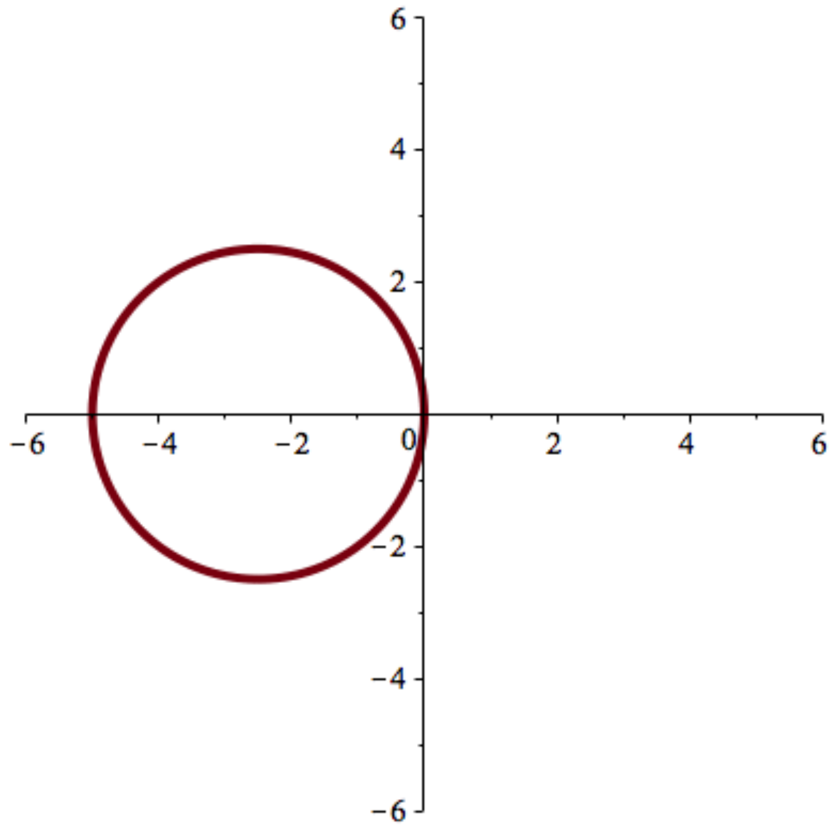
Which of the following shows the correct sketch of the polar curve $r = 5\cos(\theta)$?

on x

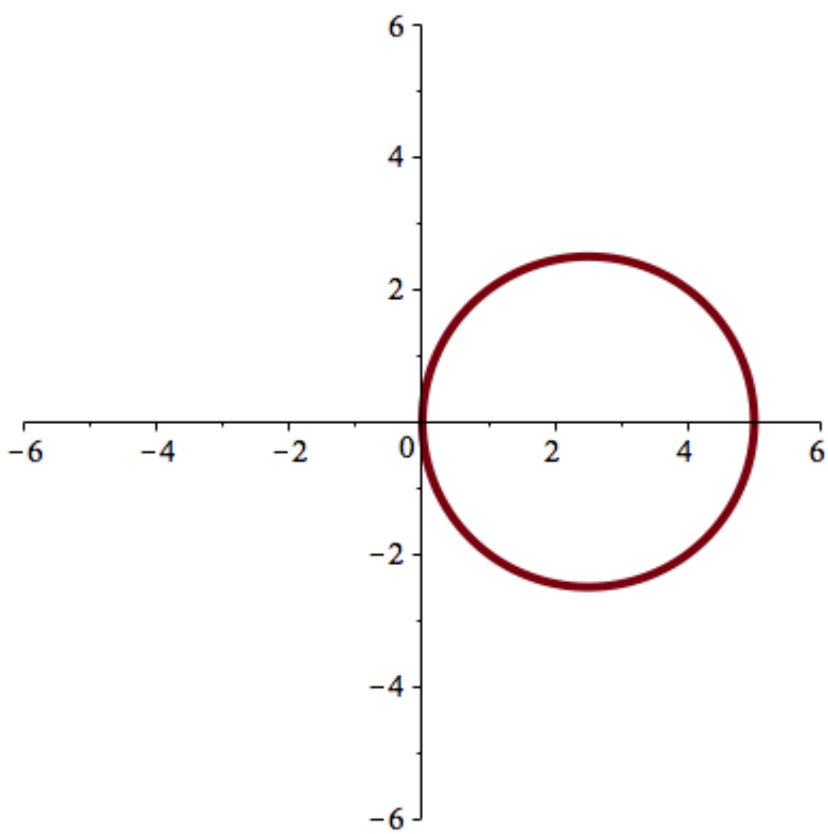
diam = 5



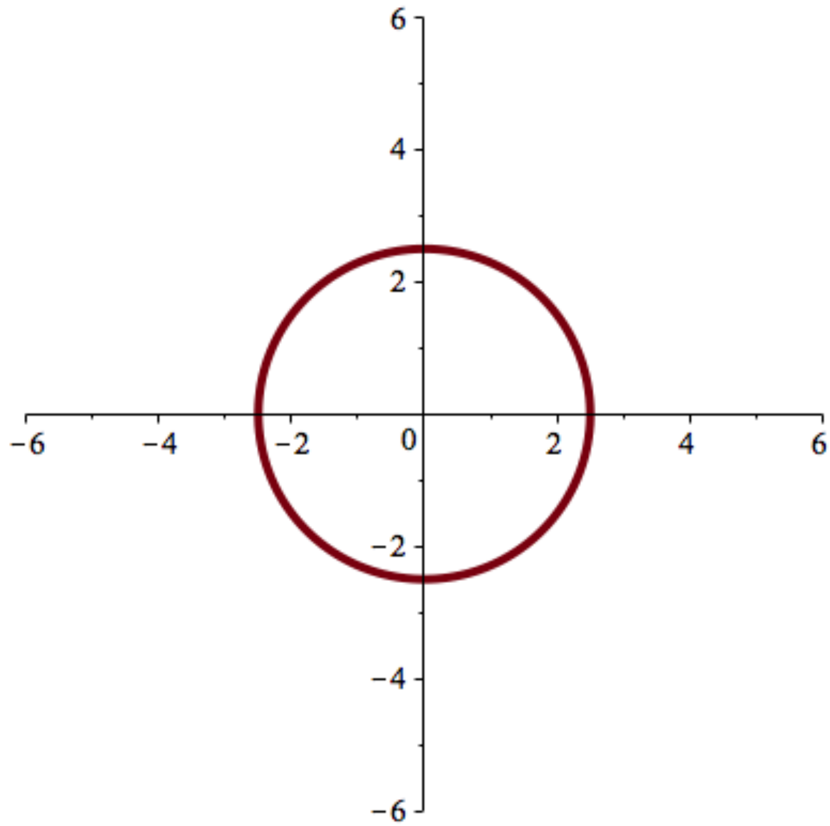
a)



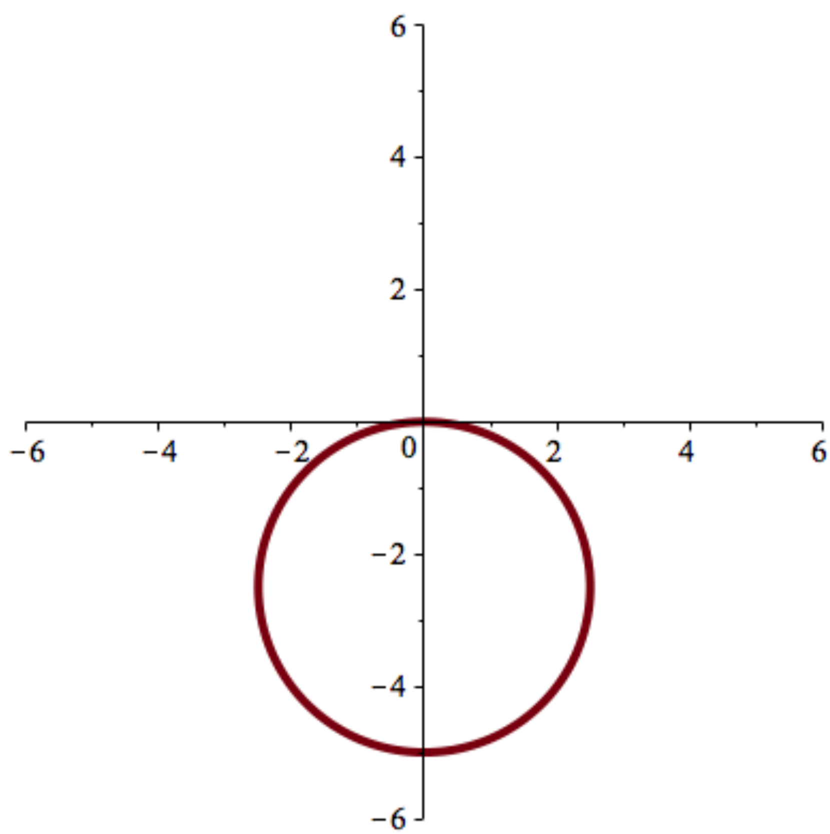
b)



c)



d) ○



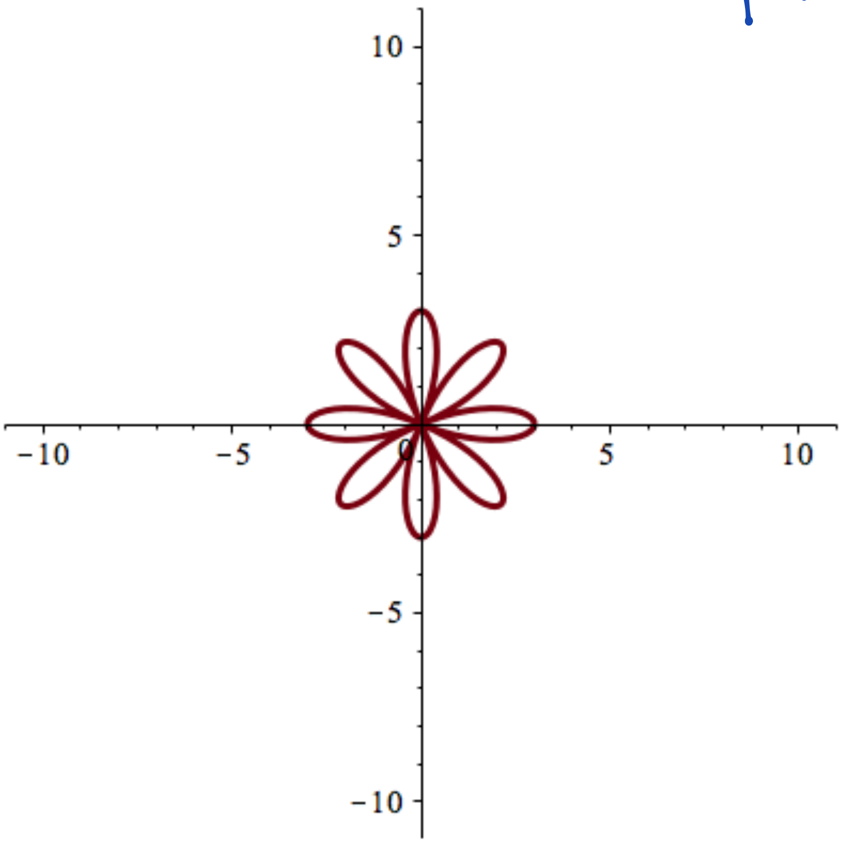
e) ○

Question 7

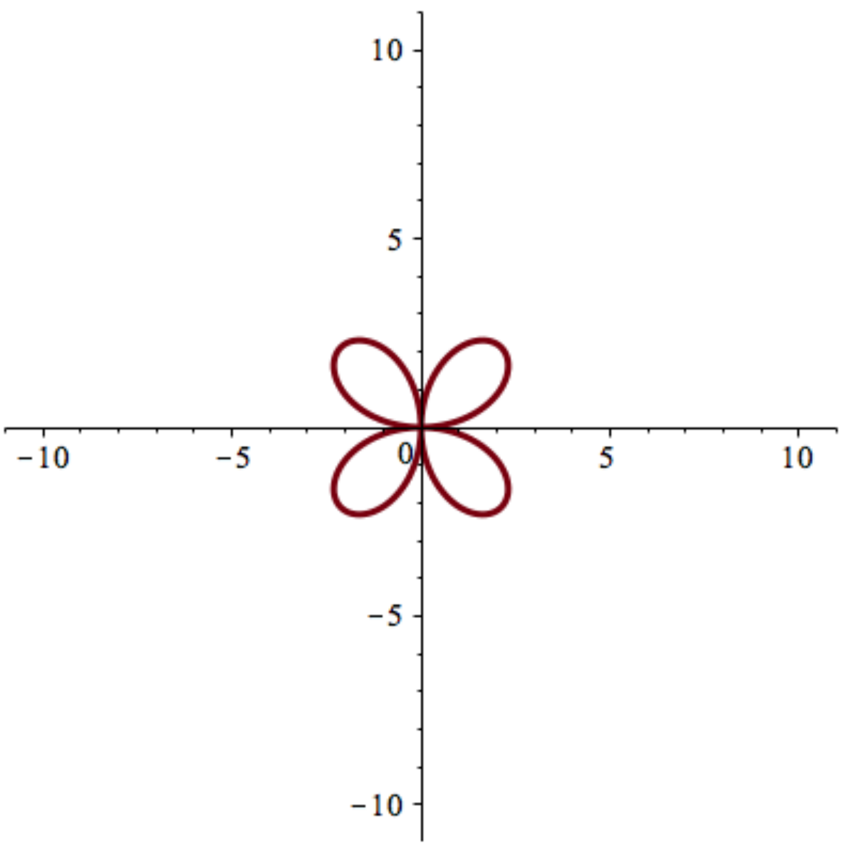
Your answer is CORRECT.

Which of the following shows the correct sketch of the polar curve $r = 3\cos(2\theta)$?

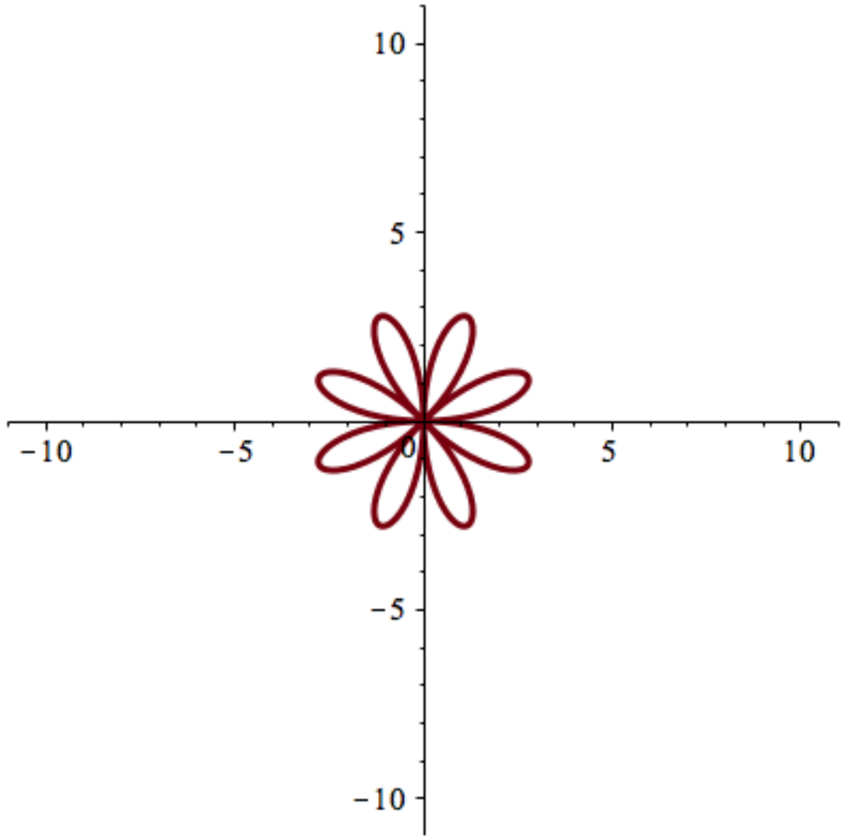
4 petals



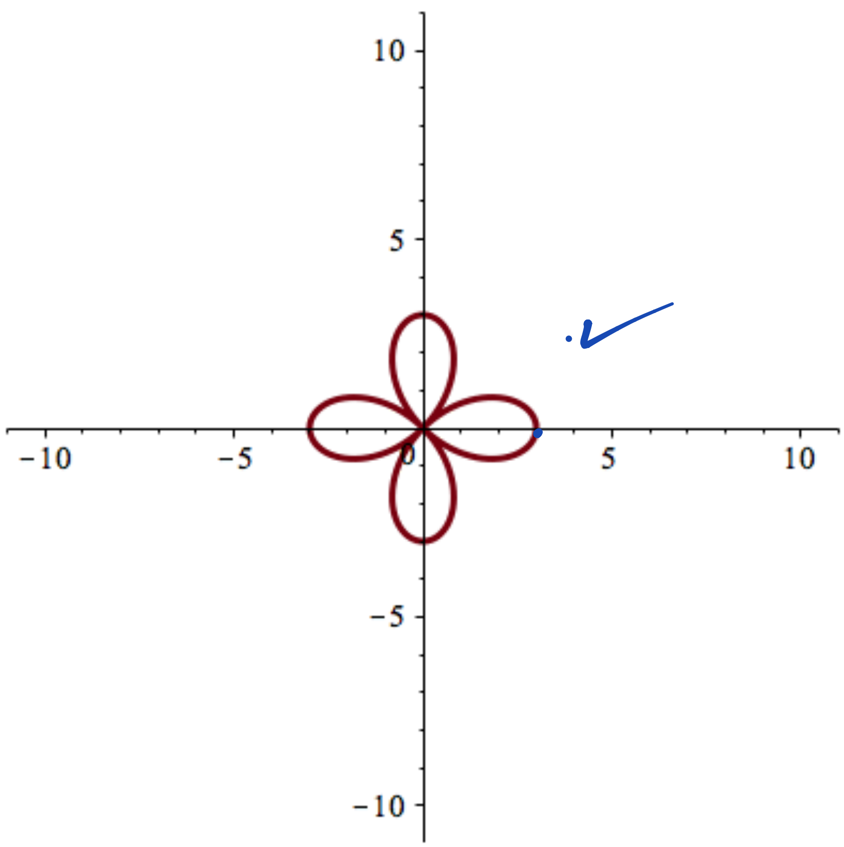
a)



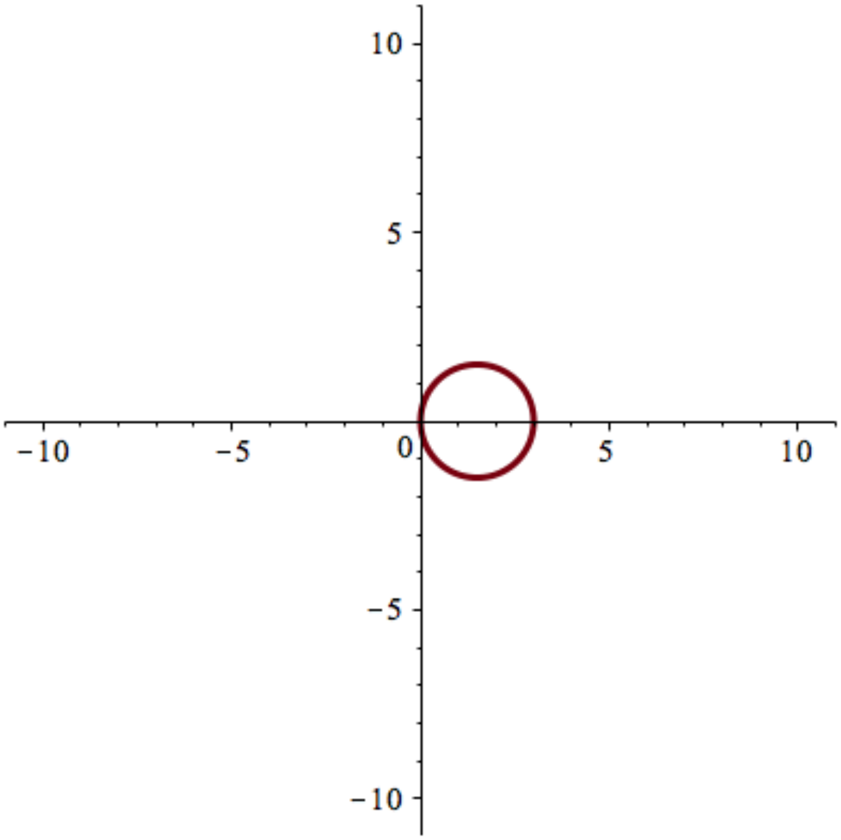
b)



c)



d)



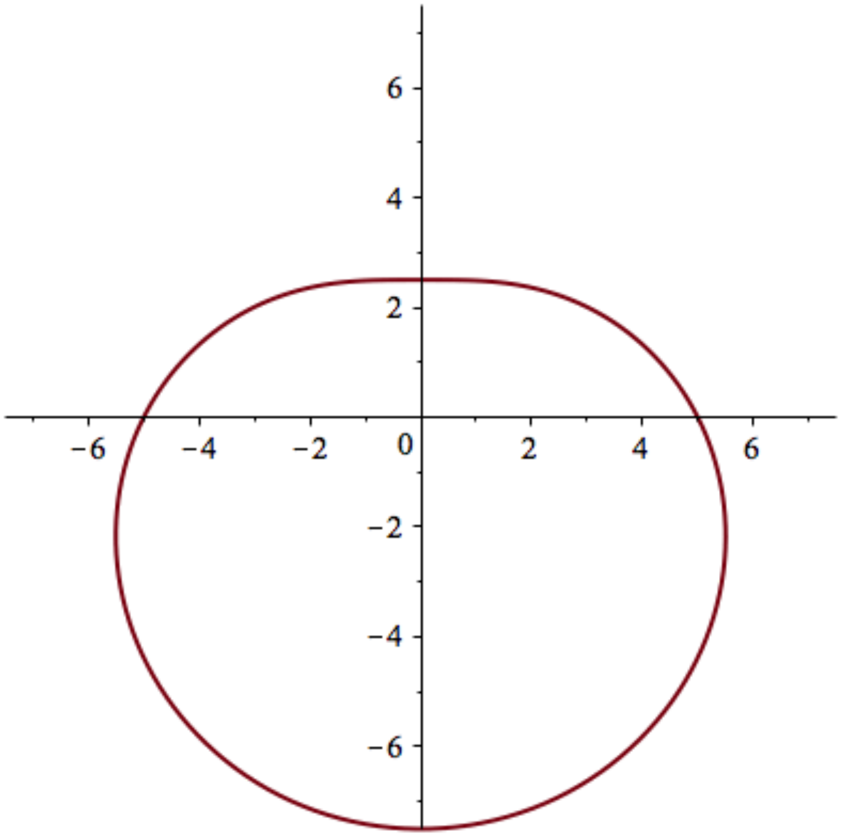
e)

Question 8

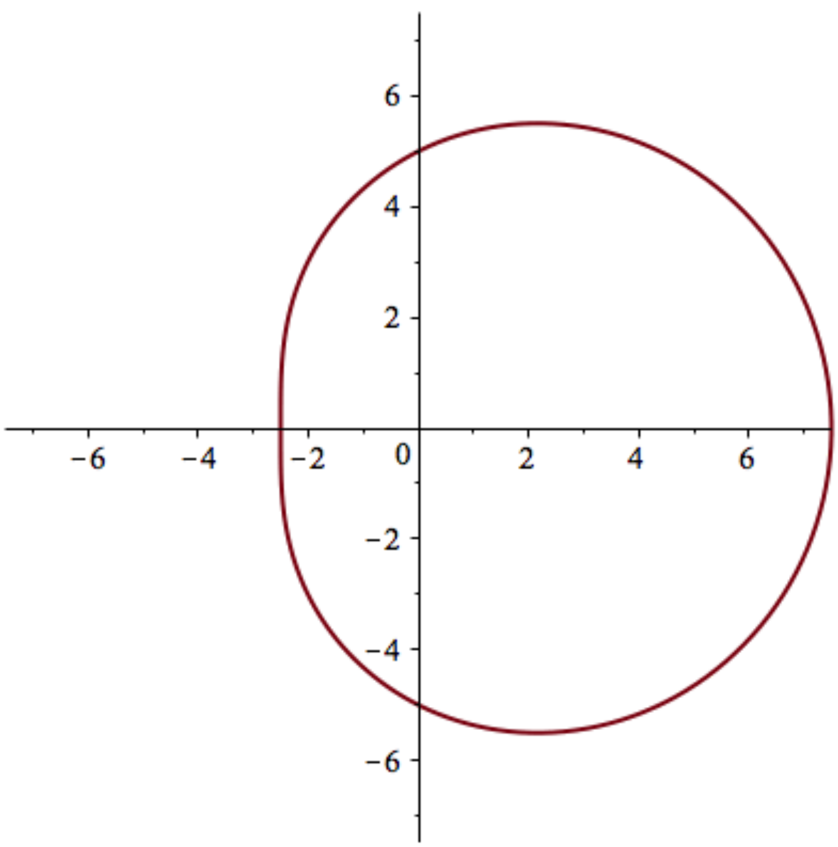
Your answer is CORRECT.

Which of the following shows the correct sketch of the polar curve $r = 5 - \frac{5}{2}\cos\theta$?

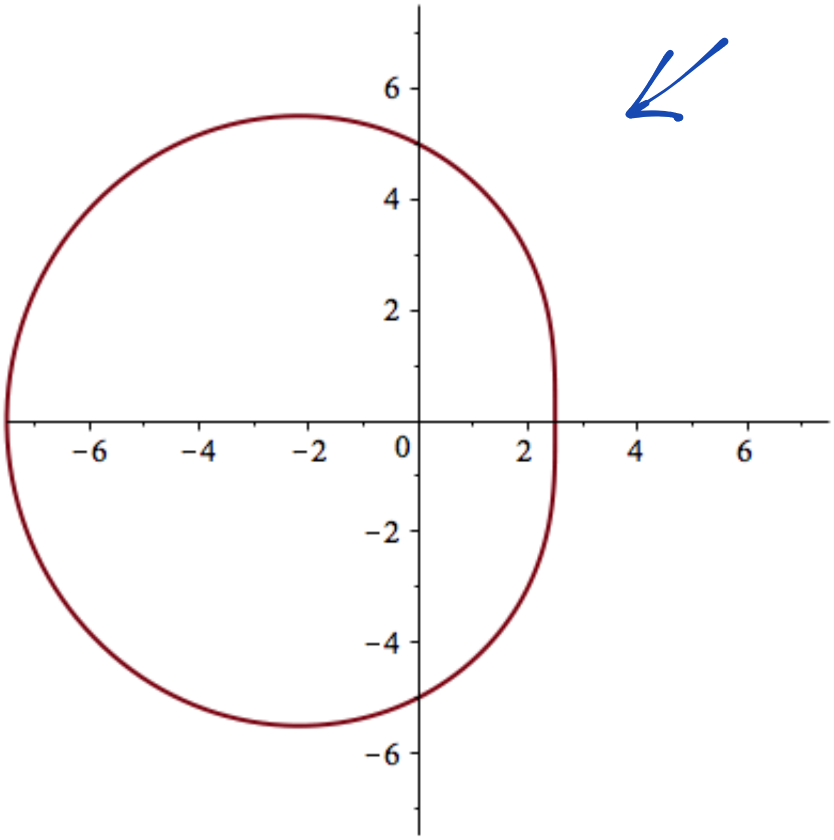
$5 > 5/2$
dent



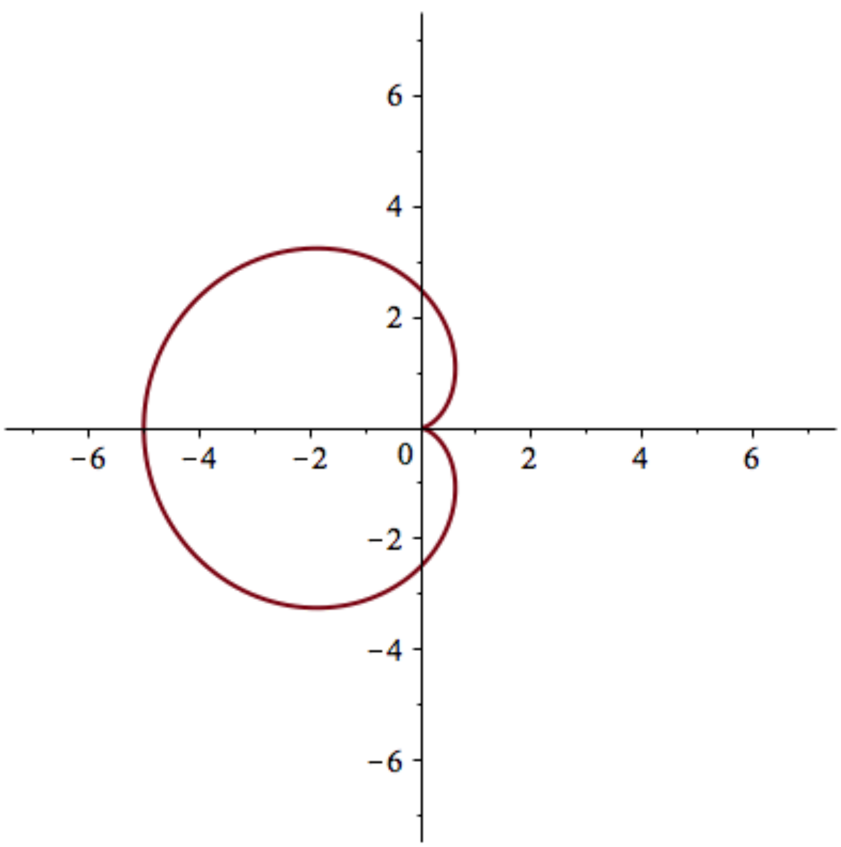
a)



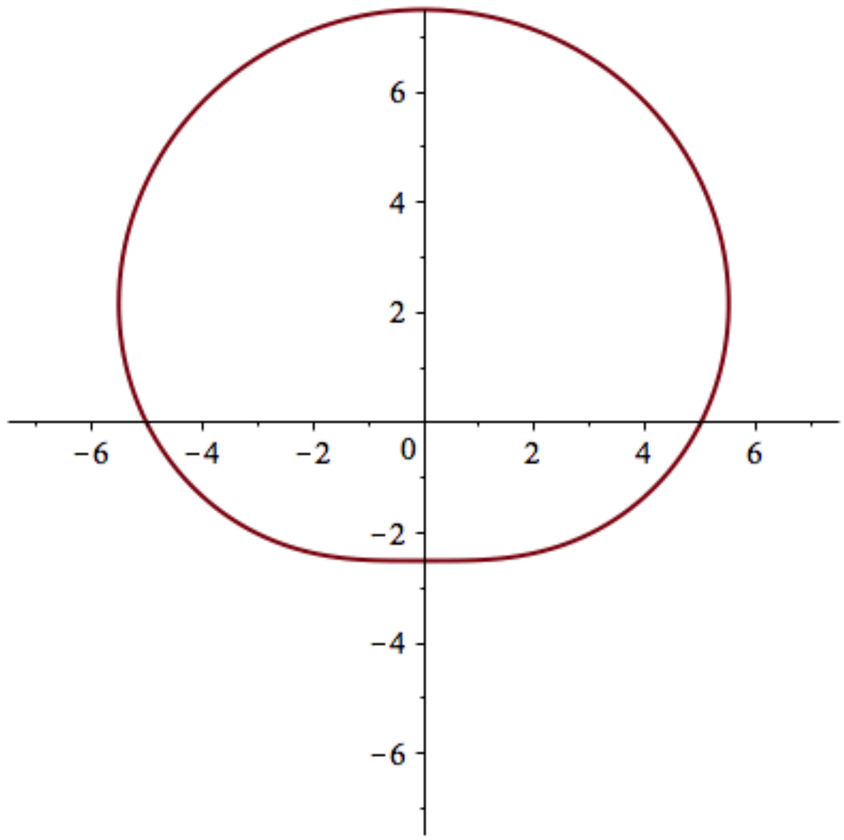
b)



c)



d)



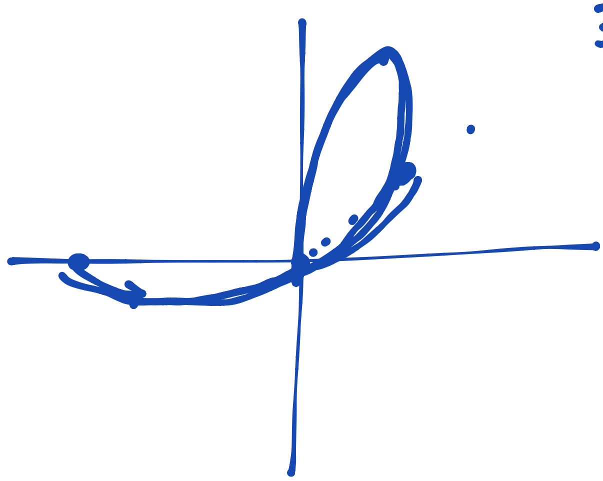
e) ◯

Question 9

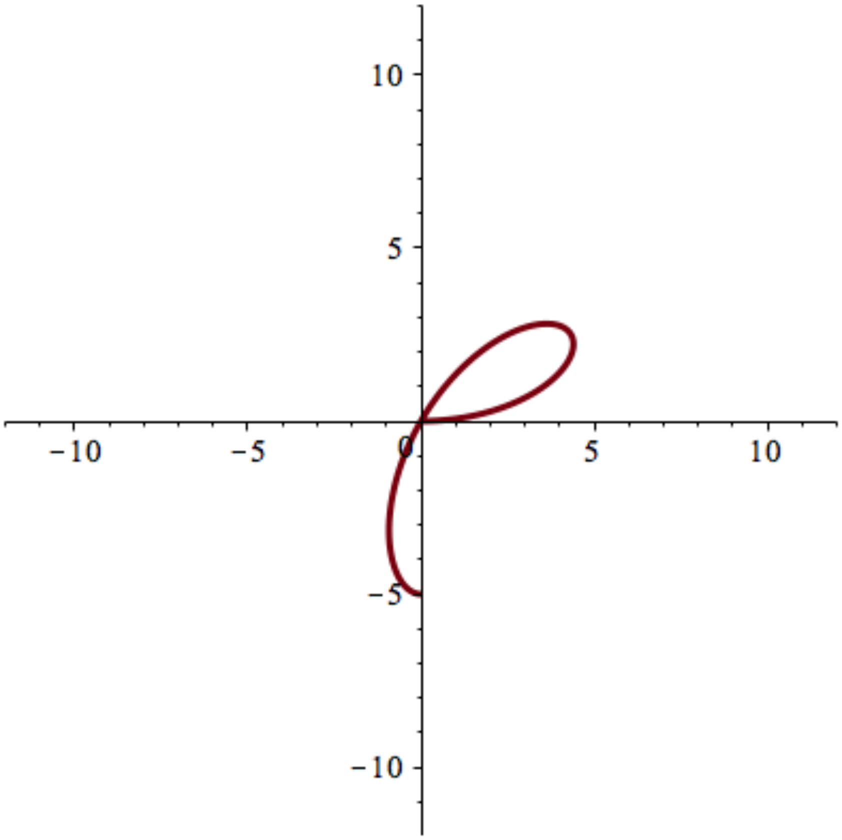
Your answer is CORRECT.

Which of the following shows the correct sketch of the polar curve $r = -5\cos(3\theta)\big|$ for $0 \le \theta \le \frac{\pi}{2}\big|$?

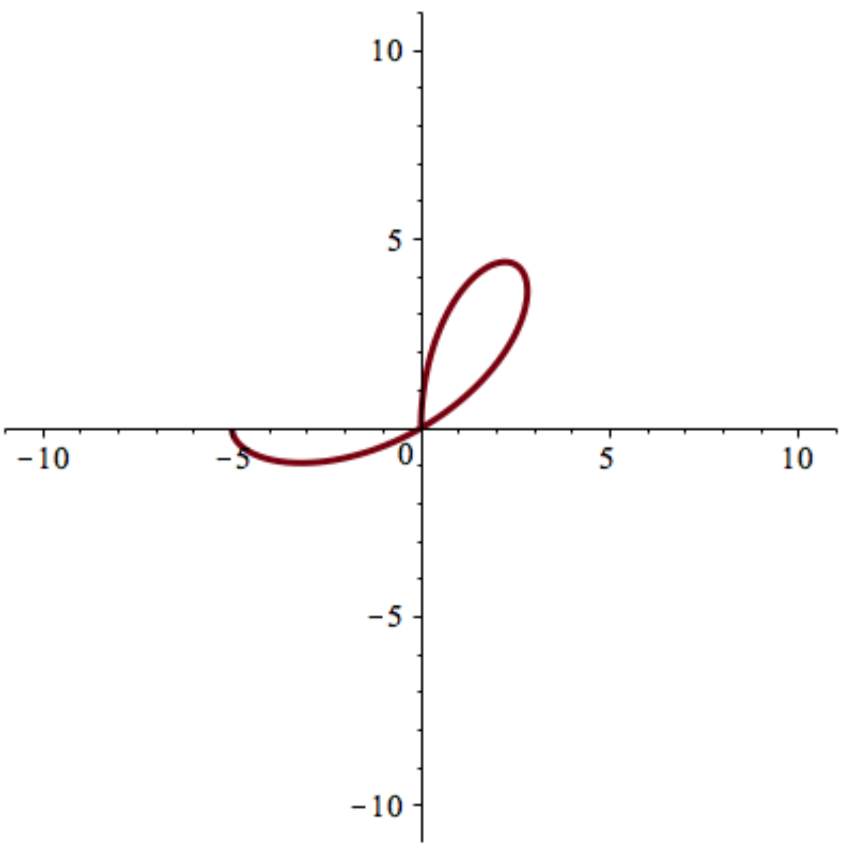
3 petals



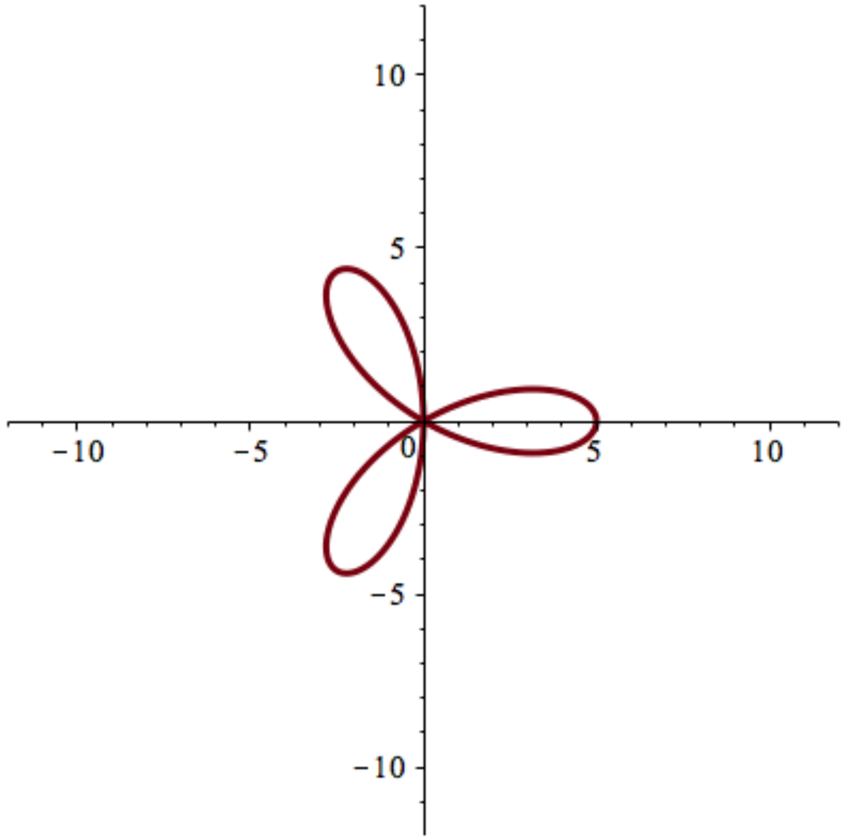
θ	r
0	-5
$\pi/6$	0
$\pi/4$	$5\sqrt{2}/2$
$\pi/3$	5
$\pi/2$	0



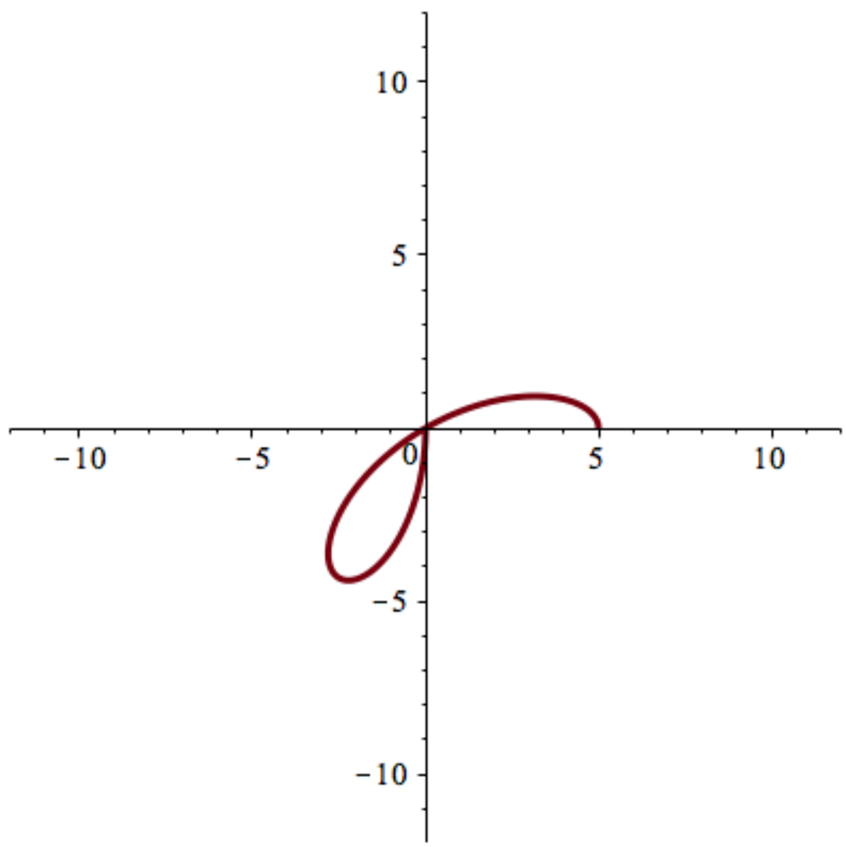
a)



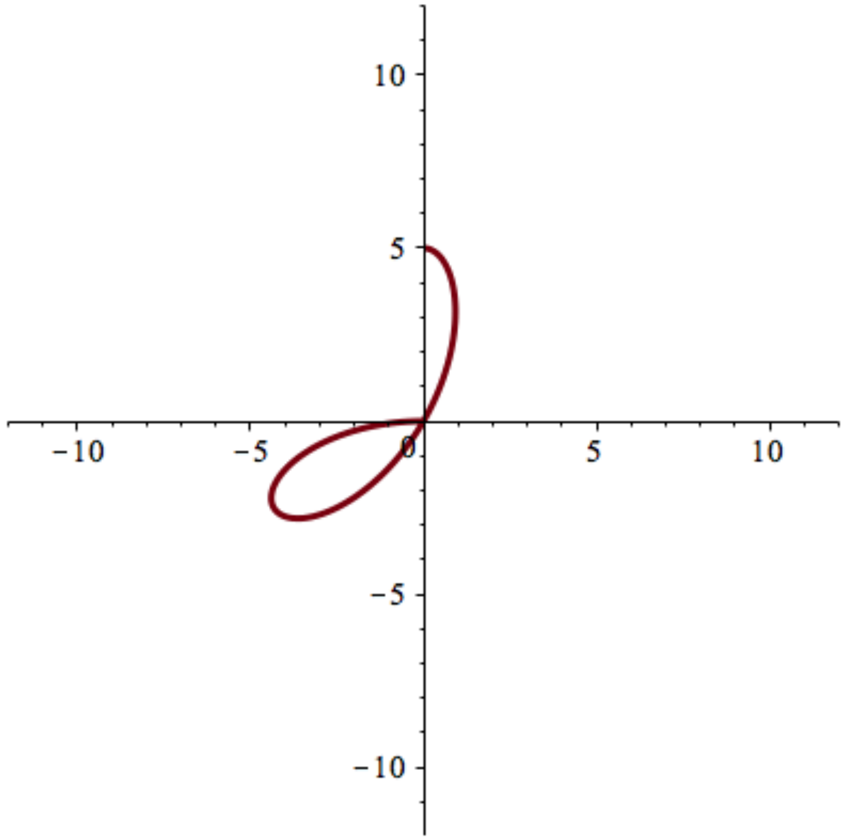
b)



c) ◯



d) ◯



e) ○

Question 10

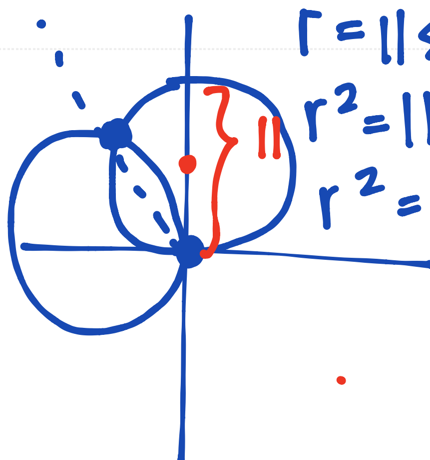
Your answer is CORRECT.

Find the rectangular coordinates of the point(s) of intersection of the polar curves $r = 11\ \sin(\theta)$ and $r = -11\ \cos(\theta)$

$r = 11\sin\theta \quad r^2 = -11x$

$r^2 = 11 r\sin\theta$

$r^2 = 11y$



a) ○ $(0, 0)$

~~**b)** ○ $\left(-\frac{11}{2}, \frac{11}{2}\right)$~~

~~**c)** ○ $(1, 1)$ and $\left(-\frac{11}{2}, \frac{11}{2}\right)$~~

d) ○ $(0, 0)$ and $(-11, 11)$ ←

e) ◉ $(0, 0)$ and $\left(-\frac{11}{2}, \frac{11}{2}\right)$ ←

$11\sin\theta = -11\cos\theta$

$\tan\theta = -1$

$\underline{\theta = 3\pi/4}$

$r = 11\sin\theta$

$x = r\cos\theta = \underline{11\sin 3\pi/4}\cos 3\pi/4 = -11/2$

$$\left(\frac{1}{2}\right)^{n+1} \frac{1}{n+1} \leq \frac{1}{10{,}000}$$

$$2^{10} = 1024$$

$n=9$:
$$\frac{1}{2^{10}(10)} = \frac{1}{10{,}240}$$