Definition of Plane Curve

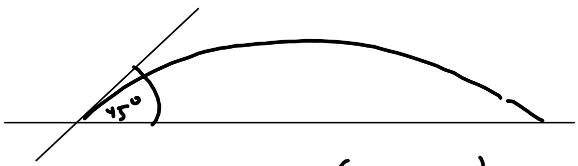
If f and g are continuous functions of t on an interval I, then the set of ordered pairs $(f(t), g(t))$ is a **plane curve** C. The equations

$x = f(t)$ and $y = g(t)$

are **parametric equations** for C, and t is the **parameter.**

Example

object propelled into the air at an angle of 45°
at a speed of 48 ft/s.



$x = x(t) = (48\cos 45^\circ)t = 48 \cdot \frac{\sqrt{2}}{2} = 24\sqrt{2}\,t$

$y = y(t) = -\frac{1}{2}gt^2 + v_0 t + y_0$

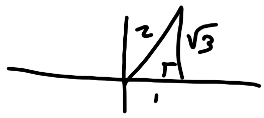
$= -\frac{1}{2}(32)t^2 + (48\sin 45^\circ)t + 0$

$= -16$

Questions? Test 4 due at midnight, tonight. Who wants to keep talking about Chapter 4?

$$\left(3(\cos 12^\circ + i\sin 12^\circ)\right)^5 = 3^5(\cos 12^\circ + i\sin 12^\circ)^5$$

60°



$$= 3^5(\cos(60^\circ) + i\sin(60^\circ))$$

$$= 3^5\left(\frac{1}{2} + i\left(\frac{\sqrt{3}}{2}\right)\right)$$

Last Question on Practice Test 4.

$$= \frac{243}{2} + \frac{243\sqrt{3}}{2}i$$

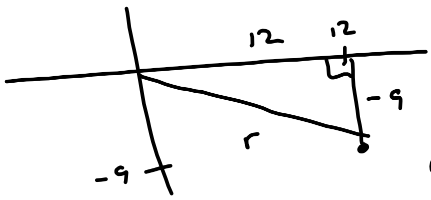
4.3 #6

6. 0/2 points

Plot the complex number and find its absolute value.

$z = 12 - 9i$ →

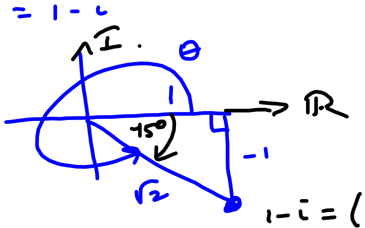
$$|z| = \sqrt{12^2 + 9^2} = r = \sqrt{144 + 81} = \sqrt{225} = 15$$



$(12, -9) = 12 - 9i$

$x^5 - (1 - i) = 0$ $\quad \sqrt[5]{1-i}$

$x^5 = 1 - i$



$1 - i = (1, -1)$

$\theta = \arctan\left(\frac{-1}{1}\right)$ is not precise.

Want $0 \le \theta < 2\pi$

$\arctan(-1) = -45^\circ$

So $\theta = 360^\circ - 45^\circ = 315^\circ$

0 $\quad \sqrt[5]{1-i} = \sqrt[5]{\sqrt{2}}\left(\cos(63^\circ) + i\sin(63^\circ)\right)$

$\sqrt[5]{\sqrt{2}}$

$= \left(2^{\frac{1}{2}}\right)^{\frac{1}{5}} = 2^{\frac{1}{2}\cdot\frac{1}{5}} = 2^{\frac{1}{10}}$

$= \sqrt[10]{2}$

$\frac{315^\circ}{5} = 63^\circ$

increment: $\frac{2\pi}{5}$ OR $\frac{360^\circ}{5} = 72^\circ$

1 $\quad 63^\circ + 72^\circ = 135^\circ$

2 $\quad 135^\circ + 72^\circ = 207^\circ$

3 $\quad 207^\circ + 72^\circ = 279^\circ$

4 $\quad 279^\circ + 72^\circ = 351^\circ$

0 $\quad \sqrt[10]{2}\left(\cos 63^\circ + i\sin 63^\circ\right)$

1

2 $\quad \vdots$

3

4 $\quad \sqrt[2]{2}\left(\cos 351^\circ + i\sin 351^\circ\right)$

Do it in Radians:

$315^\circ = \frac{7\pi}{4} = \cancel{\frac{35\pi}{20}} = \theta$

$\frac{2\pi}{5} = \frac{8\pi}{20}$

0 want $\frac{\theta}{5} = \frac{7\pi}{4}\cdot\frac{1}{5} = \frac{7\pi}{20}$

1 $\quad \frac{7\pi}{20} + \frac{8\pi}{20} = \frac{15\pi}{20} = \frac{3\pi}{4}$

2 $\quad 15 + 8 = 23$

3 $\quad 23 + 8 = 31$

4 $\quad 31 + 8 = 39$

$\sqrt[10]{2}\left(\cos\left(\frac{7\pi}{20}\right) + i\sin\left(\frac{7\pi}{20}\right)\right)$

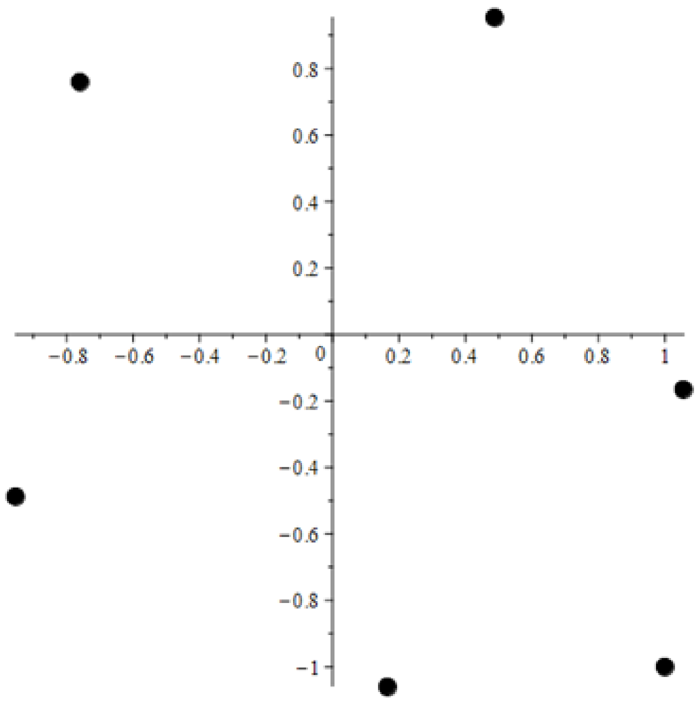
$\sqrt[10]{2}\left(\cos\left(\frac{3\pi}{4}\right) + i\sin\left(\frac{3\pi}{4}\right)\right)$

$\sqrt[10]{2}\left(\cos\left(\frac{23\pi}{20}\right) + i\sin\left(\frac{23\pi}{20}\right)\right)$

$\sqrt[10]{2}\left(\cos\left(\frac{31\pi}{20}\right) + i\sin\left(\frac{31\pi}{20}\right)\right)$

$\sqrt[10]{2}\left(\cos\left(\frac{39\pi}{20}\right) + i\sin\left(\frac{31\pi}{20}\right)\right)$

I'll graph these by viewing them as points in the Real plane.



See Maple for today's date, where I took a complex number with absolute value of $\sqrt{10}$.

There, the difference in lengths between *z* and its 5th roots is more pronounced, and it's a better picture.