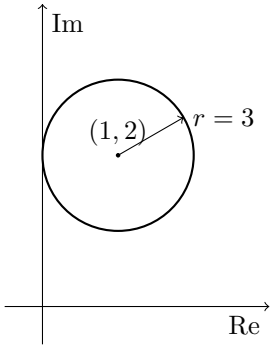
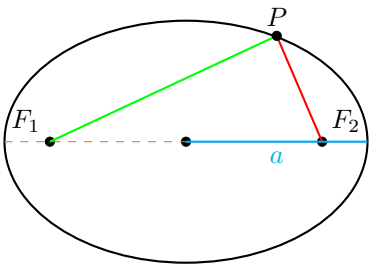
Complex Numbers

Problem Sheet, Wednesday 26.07.2023 (Room U358)

Question 1. Represent a circle with its center at $(1, 2)$ and a radius of 3 using a complex equation?

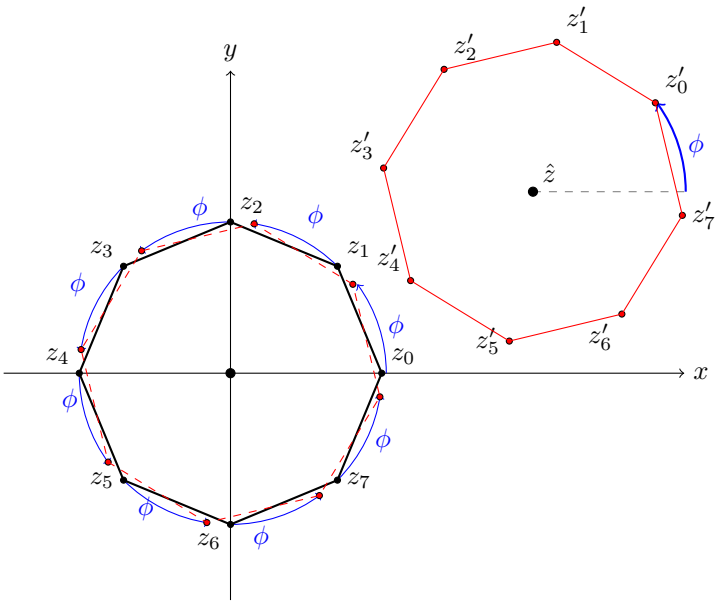


Question 2. Represent an ellipse with its foci points and semi-major axis using a complex equation? Let F_1 and F_2 represent the foci points and a represents the semi-major axis.



Question 3. Moving the Origin: How can we perform a translation or move the origin in the complex number system? (**Hint:**Translation refers to the process of moving or shifting an object from one position to another without changing its shape or orientation. In the context of complex numbers, translation involves moving the origin (the reference point) to a new location in the complex plane while maintaining the distances and angles between the complex numbers.)

Question 4. How would you go about rotating the polygon, obtained by taking the 8th roots of the complex number 1, by an angle of ϕ and then moving it by a vector defined by $\hat{z}$? Can you explain the procedure for both rotation and translation to achieve the desired transformation of the polygon in the complex plane?



Question 5. Rotating a Complex Number around a Point:

How would you rotate a complex number z by an angle θ around a fixed point P. Here's a picture illustrating the original position of the complex number z and the rotated position z':