

Math 45021 Homework 5

Due April 12th

1. pg. 147: 11.1, 11.2, 11.3, 11.4, 11.6
(I recommend doing these in geogebra)
2. A hiker, H , needs to get first to the river r and then to her tent T . Find the point X on the bank of the river so that the hiker's total trip $HX + XT$ is as short as possible.
3. From classical physics the angle of incidence is equal to the angle of reflection for light rays hitting the surface of a mirror, or a billiard ball bouncing off of the rails of a pool table. Assume that the ray starts at a point A , hits the mirror m at a point X , and reflects to the point B . Show that the path $A - X - B$ is the shortest possible path connecting A to B via a point on m .
4. Draw a line ℓ , a point O not on the line, and an angle α . Construct the image of ℓ under $R_{O,\alpha}$ in the following way: Construct $\overline{OP} \perp \ell$ such that P is on ℓ . Find P' , the image of P under $R_{O,\alpha}$. Construct the line ℓ' perpendicular to \overline{OP}' . Justify that this line is the image of ℓ under $R_{O,\alpha}$. How are ℓ' and ℓ related? Prove this.
5. Among his great-grandfather's papers, Mark found a parchment describing the location of a pirate treasure buried on a deserted island. The island contained a coconut tree (T_1), a banana tree (T_2), and a gallows (Γ) where traitors were hung. The following directions were given: "Walk from the gallows to the coconut tree, counting the number of steps. At the coconut tree, turn 90° to the right. Walk the same distance and put a spike in the ground. Return to the gallows and walk to the banana tree, counting your steps. At the banana tree, turn 90° to the left, walk the same number of steps, and put another spike in the ground. The treasure is halfway between the two spikes." Unfortunately, when Mark went to the island there were no gallows or spikes, but the two trees remained. Mark decided to dig holes at random, utilizing the juveniles from Camp Green Lake to search for the treasure, to no avail. Devise a way to find the treasure without the gallows. [Hint: use the second part of the previous problem and consider two possible locations for the gallows.]