Precalculus Applications 5.0506

1) Jake is a prisoner of war who has been shot in the leg. He has noticed a break in the fence of the prison camp infirmary grounds. The grounds are 100 m by 100 m with a search light in the center. The beam of the light sweeps in a clockwise direction along the fence and walls of the building. It takes 30 seconds for the light to make a complete sweep of the grounds. (The light is rotating at a constant rate of two turns per minute.) Jake is going to attempt to escape; he must exit the building through door C and can only get out of the grounds through the break in the fence. Once he leaves the door at point C, a silent alarm will be triggered allowing Jake only 4 minutes to make his escape. Due to the leg injury, Jake can only run at a rate of 2.055 m/sec. Once he is at the break in the fence, he will need an additional 3 seconds to work his way through the break in the fence. Fortunately, Jake thinks ahead and buried a pair of pliers at point A that will allow him to get through the break in the fence in only 3 seconds. Jake will also need to get at least 20 m beyond the fence in order to remain undetected by the light (The light beam has a 70 m radius). He can hide, without being detected by the light, inside doorways A and B. Can Jake make his escape? If so, what is his best route? You must use trigonometry and functions in your solution. A diagram is included below.