1. A surface to air missile (SAM) site is receiving position information about your aircraft. Jamming seems like a good idea, so you turn on your jamming equipment. The parameters for the radio transmitter and your jamming equipment are given below. If the SAM site needs a signal to noise ratio of 0.06 to process and receive the communication signal, is your jamming effective?

SAM radio communications	**Your jamming equipment**
Power transmitted = 1 kW	Power transmitted = 2.0 kW
Transmit Antenna Gain = 3	Transmit Antenna Gain = 20
Receive Antenna Gain = 3	
Frequency = 750 MHz	Frequency = 750 MHz
Distance = 80 km	Distance = 75 km

(a) What is the wavelength of the signal? $\lambda =$ ☐

(b) What is $P_{received}$ of the SAM radio without jamming, i.e. the signal power? Hint: Use Friis. $P_R =$ ☐

(c) What is $P_{received}$ of the SAM site due to the jammer transmission, i.e. the noise power? Hint: Use Friis. $P_R =$ ☐

(d) What is the SNR at the SAM site? SNR = [ ]

2. An adversary parabolic antenna at sea level is scanning the area for your aircraft flying at 30,000 feet AGL. Jamming seems like a good idea, so you turn on your jamming equipment. The parameters for the ground antenna and your jamming equipment are given below. If the ground antenna needs a signal to noise ratio of 0.01 to process and receive information about your aircraft, is your jamming effective *at the max LOS range*?

Ground Antenna	**Your jamming equipment**
Power transmitted = 20 kW	Power transmitted = 200 W
Transmit Antenna Gain = 2500	Transmit Antenna Gain = 10
Frequency = 9 GHz	RCS = 3 m^2

(a) What is the max LOS range? $\lambda =$ ____

(b) What is $P_{received}$ of the transmitting ground antenna without jamming? Hint: Use Radar Equation. $P_R =$ ____

(c) What is $P_{received}$ of the transmitting ground antenna due to the jammer transmission, i.e. the signal power? Hint: Use Friis. $P_R =$ ____

(d) What is the SNR at the transmitting ground antenna, i.e. the noise power?

SNR = [ ]