Fox Population Problem: Naturalists find that the populations of some kinds of predatory animals vary periodically. Assume that the population of foxes in a certain forest varies sinusoidally with time. Records started being kept when time, t = 0, years. A minimum number of 200 foxes occurred when t = 2.9 years. The next maximum of 800 foxes occurred when t = 5.1 years.

a. Write a formula expressing the number of foxes as a function of time, t. List the amplitude (A), center-line (C), period, phase shift (PS) or beginning value, and the ending value (EV).
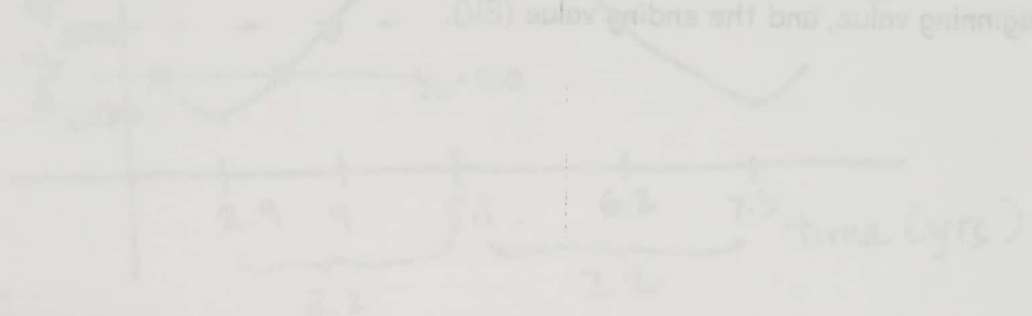
b. Graph one complete cycle of the function. Completely label your graph.
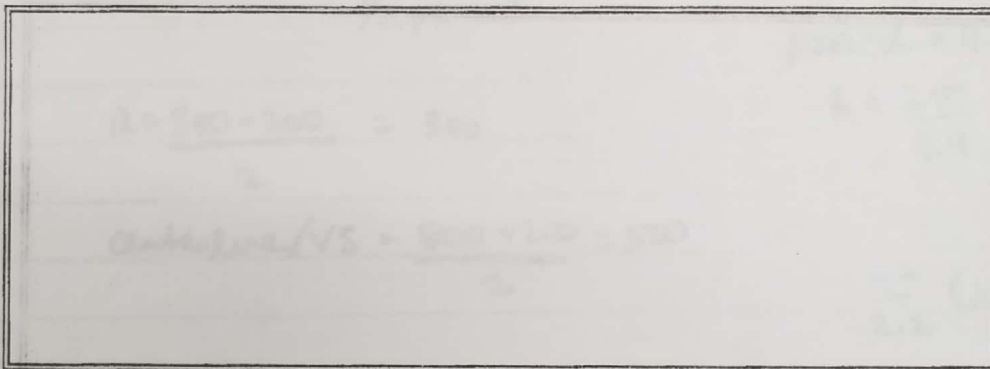
c. Predict the population when t = 7. _____

d. Foxes are considered endangered species when their population drops below 300. Between what 2 non-negative values of t were the foxes first endangered?

e. Illustrate on your graph the two locations where the foxes were first endangered.

f. Is there another time when the foxes were endangered? Why?

The Shock Felt Around the World Problem: Suppose that one day all 200 million people in the U.S. climb up on tables. At time t = 0, we all jump off. The resulting shock as we hit the Earth's surface will start the entire earth vibrating in such a way that its surface first moves down from its normal position. The displacement, y, of the surface is a sinusoidal function of time with a period of about 54 minutes. Assuming that the amplitude is 50 meters, answer the following questions.

a. Write a function expressing the displacement in terms of the time lapse since the people jumped. List the amplitude (A), center-line (C), period, phase shift (PS) or beginning value, and the ending value (EV).

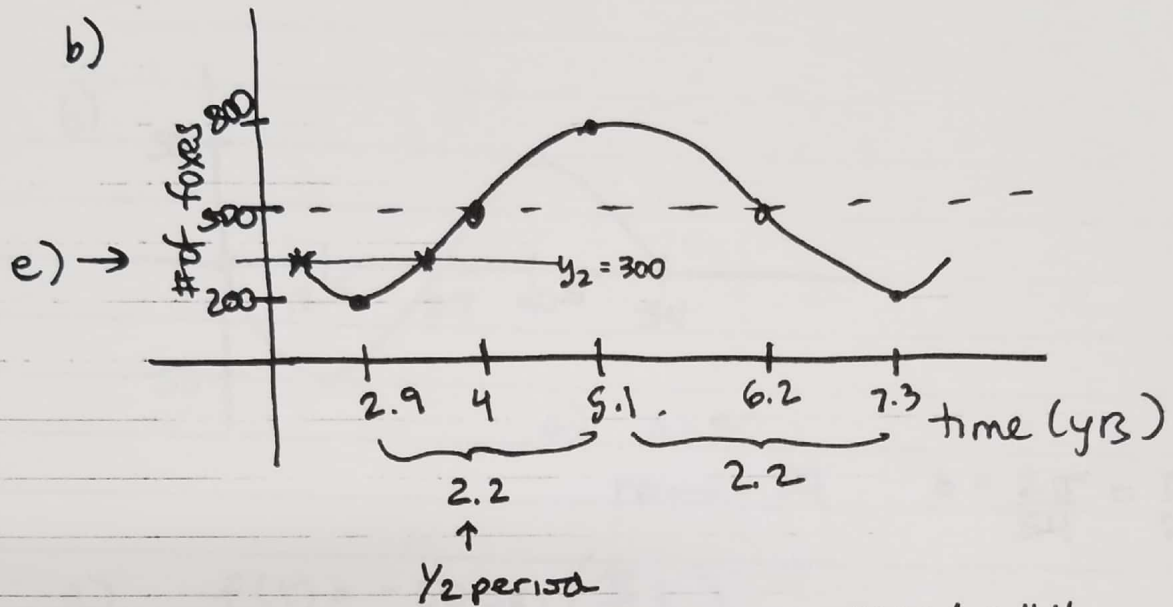b. Graph one complete cycle of the function. Completely label your graph.
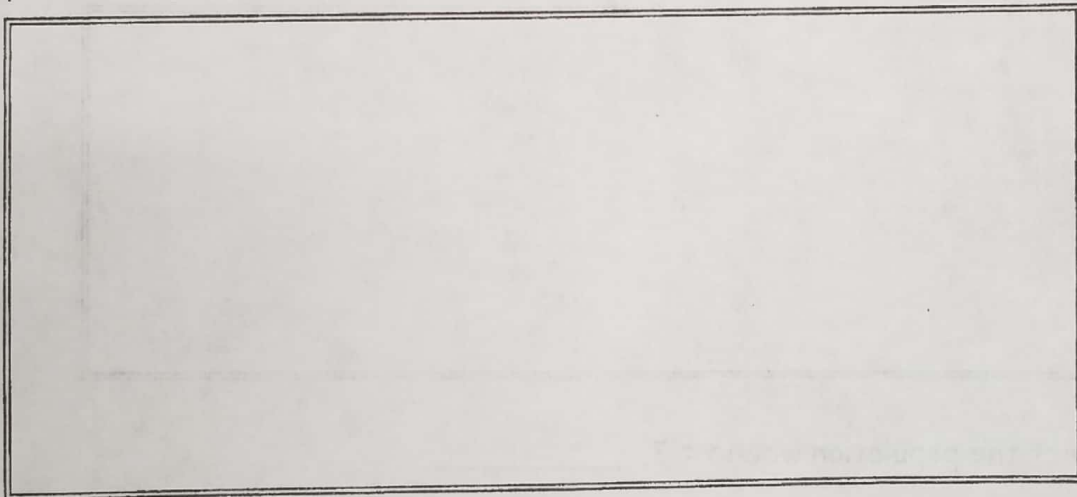
c. At what time will the first maximum (the greatest distance above the normal position) occur? _____

d. What are the first two times at which the displacement is -37 meters?

1st: _____   2nd: _____

Fox Population

b)

period = 4.4

$b = \dfrac{2\pi}{4.4} = \dfrac{\pi}{2.2}$

$a = \dfrac{800 - 200}{2} = 300$

centerline/VS $= \dfrac{800 + 200}{2} = 500$

$\dfrac{\pi}{2.2}(x - 2.9)$

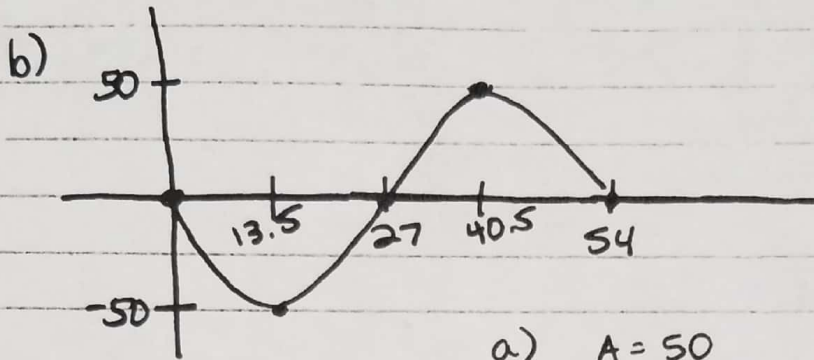a) $y = 500 - 300 \cos\left(\dfrac{\pi}{2.2}x - \dfrac{2.9\pi}{2.2}\right)$

c)   227

d) $y_2 = 300$
        between ~ 2.3 yrs & 3.5 yrs

f) Yes   between 6.711 & 7.888 yrs

The Shock Felt Around the world

b)

a) $A = 50$

Period $= 54$ $b = \dfrac{2\pi}{54} = \dfrac{\pi}{27}$

a) $f(t) = -50 \sin\left(\dfrac{\pi}{27} t\right)$

c)   40.5 min.

d)   1st → 7.16 min   2nd → 19.84 min