Math 196L **PROBLEM SET 3** **NAME:**

Instructions: Read each problem. Write a sentence or two about the approach you might take to solve each problem. Draw a picture to illustrate the scenario. Write a formula that might be needed to help set up or solve the problem.

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1. According to Postal Service regulations, the girth plus the length of a parcel sent by Priority Mail may not exceed 108 inches. Estimate the largest possible volume of a rectangular box with a square base.

2. Oil is spilled from a tanker into the Pacific Ocean. Suppose the area of the oil spill is approximately a circle and that its radius is increasing at a rate of 2.5 miles per hour. Write the area function in terms of the time since the spill occurred.

3. Antonio and Lucia are both driving through the desert from Tucson to San Diego, which takes 7 hours of driving time. Antonio's car starts out full with 14 gallons of gas and uses 2 gallons per hour. Lucia's SUV starts out full with 30 gallons of gas and uses 6 gallons per hour. Both drivers leave Tucson at 10:00 a.m. and plan to meet at 11:30 a.m. to take a 30 minute lunch break and fill their tanks. Assume each person stops for gas when their tank is nearly empty and each gas stop takes 15 minutes.

A) Let $A(t)$ represent the number of gallons of gas in Antonio's tank, and $L(t)$ represent the number of gallons of gas in Lucia's tank, where t is the number of hours since 10:00 a.m. Sketch the graphs of $y = A(t)$ and $y = L(t)$ on the same set of axes. Label all important points.

B) Does Antonio need to make another gas stop before reaching San Diego? Does Lucia? At what time does each car reach the destination?

C) Write expressions for $y = A(t)$ and $y = L(t)$. Indicate the domain for each.

D) Marco has the same make and model car as Antonio, and gets the same gas mileage. He is also driving to San Diego but leaves Tucson at 11:30 a.m. with a full tank. Let $M(t)$ represent the number of gallons of gas in Marco's tank, where t is the number of hours since 10:00 a.m. Express $M(t)$ as a transformation of $A(t)$.

E) Sophia is taking the same trip in an SUV that has a tank that holds 36 gallons and uses 6 gallons per hour. Let S(t) represent the number of gallons of gas in Sophia's tank, where t is the number of hours since 10:00 a.m. Is it true that S(t) = L(t) + 6? Explain.

Part 2:

1. Solve the following inequalities.

A) $(y-1)^3 - 4y(y-1)^2 \geq 0$ B) $\frac{x}{x+1} \geq 1$ C) $\frac{t(t-A)}{t+A} \geq 0$ Assume A is a positive constant.

2. Write the equation of the circle that satisfies the given conditions.
The line connecting the points (3, 2) and (-1, 6) forms a diameter of the circle.

3. Based on data from the Kelley Blue Book, the value V for a Ford Focus hatchback t years after today can be modeled by the linear model:

$$V = -1504t + 14{,}632$$

(Always in your description include value and the units)

A) What is the practical interpretation of the number -1504 in the formula?
B) What is the practical interpretation of the number 14,632 in the formula?
C) What is the horizontal intercept? And what is the practical interpretation of this value?