Problem 1. Evaluate each limit using l'Hospital's rule.

a. $\lim\limits_{x \to 0} \frac{\sin(7x)}{\tan(5x)}$

b. $\lim\limits_{x \to 0} \frac{e^x - 1}{\sin(2x)}$

d. $\lim\limits_{x \to 0} \frac{10^x - 15^x}{x}$

e. $\lim\limits_{x \to \infty} \left\{ 5xe^{1/x} - 5x \right\}$

f. $\lim\limits_{x \to \infty} \left[x - x^2 \ln\left(\frac{x+1}{x}\right) \right]$

g. $\lim\limits_{x \to \infty} \left(\frac{10x}{10x+4} \right)^{6x}$

Problem 2. A cylinder is inscribed in a right circular cone of height 6 and radius (at the base) equal to 5.5 . What are the dimensions of such a cylinder which has maximum volume?

Problem 3. A rectangle is inscribed with its base on the x-axis and its upper corners on the parabola $y = 5 - x^2$. What are the dimensions of such a rectangle with the greatest possible area?

Problem 4. A farmer has 2400 ft of fencing and wants to fence off a rectangular field that borders a straight river. He needs no fence along the river. What are the dimensions of the field that has the largest area?

Problem 5. Find the coordinate of the point on the line $-10x + 6y + 4 = 0$ which is closest to the point (-2 , 1).

Problem 6. A window is being built and the bottom is a rectangle and the top is a semicircle. If there is 12 m of framing materials what must the dimensions of the window be to let in the most light?

Problem 7. Determine the area of the largest rectangle that can be inscribed in a circle of radius 4.