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

(a) Picture and Variables.

(b) Set up, but do not evaluate, the function and the equation in terms of two variables as we did in class. That is, choose MAXIMIZE or MINIMIZE, find appropriate expressions at underlines ___ in the followings;

\[
\begin{align*}
\text{MAXIMIZE/MINIMIZE} & \quad \underbrace{\text{\,}}_{\text{\,}} \\
\text{Restricted to} & \quad \underbrace{\text{\,}}_{\text{\,}}
\end{align*}
\]

(The object to optimize using two variables from (a))
(The equation type of restriction on your two variables)

(c) Set up, but do not evaluate, the single variable function and the interval to be solved as we did in class.

\[
\begin{align*}
\text{MAXIMIZE/MINIMIZE} & \quad (\quad ) = \underbrace{\text{\,}}_{\text{\,}} \\
\text{Restricted to} & \quad \underbrace{\text{\,}}_{\text{\,}}
\end{align*}
\]

(The single variable function to optimize)
(A valid (open or closed) interval on your variable)
(d) Find the optimum points of the function in (c). Show the reason why your critical point yields the optimum value.

(e) Interpret your answer. That is, state clearly the dimensions.
2. A cylindrical can is to be made to hold 1 L (=1000 cm$^3$) of oil. Find the dimensions that will minimize the cost of the metal to manufacture (i.e., the surface area) of the can.

(a) Picture and Variables.

(b) Set up, but do not evaluate, the function and the equation in terms of two variables as we did in class. That is, choose MAXIMIZE or MINIMIZE, find appropriate expressions at underlines ___ in the followings;

\[
\begin{aligned}
\text{MAXIMIZE/MINIMIZE} & \quad \underline{\quad} \\
\text{Restricted to} & \quad \underline{\quad}
\end{aligned}
\]

(The object to optimize using two variables from (a))

(The equation type of restriction on your two variables)

(c) Set up, but do not evaluate, the single variable function and the interval to be solved as we did in class.

\[
\begin{aligned}
\text{MAXIMIZE/MINIMIZE} & \quad ( \quad ) = \underline{\quad} \\
\text{Restricted to} & \quad \underline{\quad}
\end{aligned}
\]

(The single variable function to optimize)

(A valid (open or closed) interval on your variable )
(d) Find the optimum points of the function in (c). Show the reason why your critical point yields the optimum value.

(e) Interpret your answer. That is, state clearly the dimensions.
3. Find the dimensions of the rectangle of largest area that has its base on the $x$-axis and its other two vertices above the $x$-axis and lying on the parabola $y = 8 - x^2$.

(a) Picture and Variables.

(b) Set up, but do not evaluate, the function and the equation in terms of two variables as we did in class. That is, choose MAXIMIZE or MINIMIZE, find appropriate expressions at underlines in the followings:

\[
\begin{align*}
\text{MAXIMIZE/MINIMIZE} & \quad \underline{\text{ }} \quad \underline{\text{ }} \\
\text{Restricted to} & \quad \underline{\text{ }} \quad \underline{\text{ }} \\
\end{align*}
\]

(The object to optimize using two variables from (a))

(The equation type of restriction on your two variables)

(c) Set up, but do not evaluate, the single variable function and the interval to be solved as we did in class.

\[
\begin{align*}
\text{MAXIMIZE/MINIMIZE} & \quad ( ) = \underline{\text{ }} \\
\text{Restricted to} & \quad \underline{\text{ }} \\
\end{align*}
\]

(The single variable function to optimize)

(A valid (open or closed) interval on your variable)
(d) Find the optimum points of the function in (c). Show the reason why your critical point yields the optimum value.

(e) Interpret your answer. That is, state clearly the dimensions.
4. Find the points on the parabola $y^2 = 2x$ that is closest to the point $(1, 4)$.

(a) Picture and Variables.

(b) Set up, but do **not** evaluate, the function and the equation in terms of two variables as we did in class. That is, choose MAXIMIZE or MINIMIZE, find appropriate expressions at underlines ___ in the followings;

\[
\begin{cases}
\text{MAXIMIZE/MINIMIZE} & \underline{\quad} \\
\text{Restricted to} & \underline{\quad}
\end{cases}
\]

(The object to optimize using two variables from (a))

(The equation type of restriction on your two variables)

(c) Set up, but do **not** evaluate, the single variable function and the interval to be solved as we did in class.

\[
\begin{cases}
\text{MAXIMIZE/MINIMIZE} & (\quad) = \underline{\quad} \\
\text{Restricted to} & \underline{\quad}
\end{cases}
\]

(The single variable function to optimize)

(A valid (open or closed) interval on your variable)
(d) Find the optimum points of the function in (c). Show the reason why your critical point yields the optimum value.

(e) Interpret your answer. That is, state clearly the points.