Calculus
Lecture 6

Oktay Ölmez, Murat Şahin and Serhan Varma

Practical Problems

Practical Problems

- Step 1: Draw a diagram.

Practical Problems

- Step 1: Draw a diagram.
- Step 2: Write a formula for the objective function.

Practical Problems

- Step 1: Draw a diagram.
- Step 2: Write a formula for the objective function.
- Step 3: Eliminate all but one of the variables and express the objective function as a function a single variable

Practical Problems

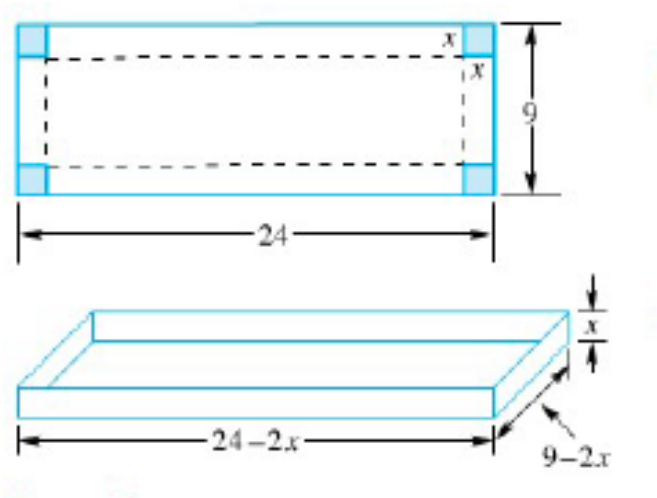
- Step 1: Draw a diagram.
- Step 2: Write a formula for the objective function.
- Step 3: Eliminate all but one of the variables and express the objective function as a function a single variable
- Step 4: Find all critical points.

Practical Problems

- Step 1: Draw a diagram.
- Step 2: Write a formula for the objective function.
- Step 3: Eliminate all but one of the variables and express the objective function as a function a single variable
- Step 4: Find all critical points.
- Step 5: Use the FDT and SDT to determine the maximum or the minimum.

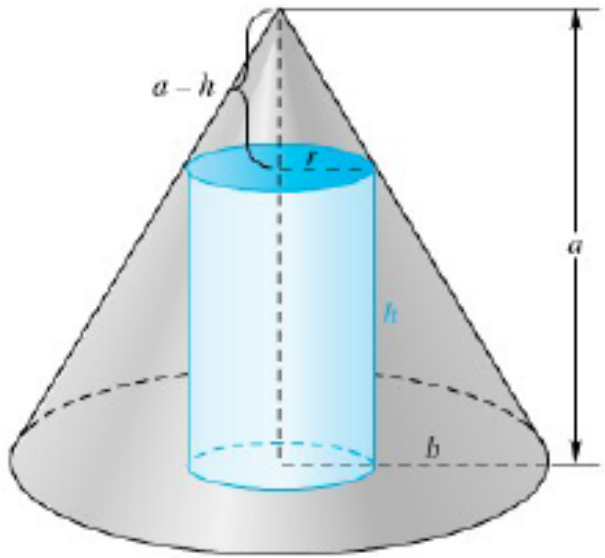
Example

A rectangular box is to be made from a piece of cardboard 24 inc long and 9 inc wide by cutting out identical squares from the four corners and turning up the sides. Find the dimensions of the box of maximum volume. What is this volume?



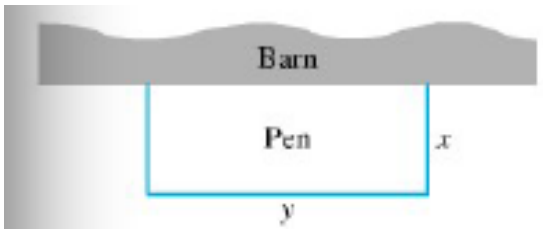
Example

Find the dimensions of the the right circular cylinder of greatest volume that can be inscribed in a given right circular cone with radius b and height a.



Example

A farmer has 80 ft of fence with which he plans to enclose a rectangular pen along one side of his 100 foot barn. What are the dimensions of the pen that has maximum area?



Graphing Functions

The following steps are helpful when sketching curves.

Graphing Functions

The following steps are helpful when sketching curves.

- Domain: Find the domain of the function. This will be useful when finding vertical asymptotes and determining critical numbers.

Graphing Functions

The following steps are helpful when sketching curves.

- Domain: Find the domain of the function. This will be useful when finding vertical asymptotes and determining critical numbers.
- Intercepts: Find the $x-$ and $y-$intercepts of the function, if possible.

Graphing Functions

The following steps are helpful when sketching curves.

- Domain: Find the domain of the function. This will be useful when finding vertical asymptotes and determining critical numbers.
- Intercepts: Find the $x-$ and $y-$intercepts of the function, if possible.
- Symmetry: Determine whether the function is an odd function, an even function or neither odd nor even. If $f(-x) = f(x)$ for all x in the domain, then f is even and symmetric about the $y-$axis. If $f(-x) = -f(x)$ for all x in the domain, then f is odd and symmetric about the origin.

Graphing Functions

Graphing Functions

- Asymptotes: Find the asymptotes of the function using the methods described above. First attempt to find the vertical and horizontal asymptotes of the function. IF necessary, find the slant asymptote.

Graphing Functions

- Asymptotes: Find the asymptotes of the function using the methods described above. First attempt to find the vertical and horizontal asymptotes of the function. IF necessary, find the slant asymptote.
- Intervals of Increase and Decrease: Use the derivative of the function to find the intervals where the function is increasing and decreasing.

Graphing Functions

- Asymptotes: Find the asymptotes of the function using the methods described above. First attempt to find the vertical and horizontal asymptotes of the function. IF necessary, find the slant asymptote.
- Intervals of Increase and Decrease: Use the derivative of the function to find the intervals where the function is increasing and decreasing.
- Local Maximum/Minimum : Find the critical points of the function.

Graphing Functions

- Asymptotes: Find the asymptotes of the function using the methods described above. First attempt to find the vertical and horizontal asymptotes of the function. IF necessary, find the slant asymptote.
- Intervals of Increase and Decrease: Use the derivative of the function to find the intervals where the function is increasing and decreasing.
- Local Maximum/Minimum : Find the critical points of the function.
- Concavity and Points of Inflection : We must determine when $f''(x)$ is positive and negative to find the intervals where the function is concave upward and concave downward. Inflection points occur whenever the curve changes in concavity.