

1. A textile company sells unusually shaped decorative panels: they look like two semicircles on opposite sides of a rectangle. An important part of their product is that they guarantee 10 feet of valuable lacework on the edge, as well as the largest area of any manufacturer. Using this information, determine the dimensions of the panels.

Remember to go through each step carefully. Use a sign chart to classify minima and maxima, double-checking with the 2nd derivative test where possible.

2. Construct a sign chart for a function with the following derivative defined between $x = 1$ and $x = 5$. Label where the function is increasing and decreasing, the local mins and maxes, the global mins and maxes, and use the second derivative test to double-check.

$$H'(x) = -x(x - 2)(x - 4) \ln(x)$$

3. Estimate the area function under the curve $y = e^x$ between $x = 0$ and $x = t$ with a power series. Do the same for $\ln(x)$ between 1 and $x = t$.

4. Use power series to solve the rate equation

$$f''(x) = 2f(x)$$

$$f'(0) = 3$$

$$f(0) = 0$$

Approximate $f(2)$ with this series.