

Problem 1

1. A window is being built and the bottom is a rectangle and the top is a semicircle. If there is 12 metres of material what must the dimensions of the window be to let in the most light?
2. Determine the area of the largest rectangle that can be inscribed in a circle of radius r .

Problem 2

State whether each of these limit forms are indeterminate or not. If not, evaluate what the limit would be.

1. $\frac{0}{0}$
2. $\frac{\infty}{\infty}$
3. $\frac{0}{\infty}$
4. $\frac{\infty}{0}$
5. $\infty + \infty$
6. $\infty - \infty$
7. $\infty \cdot \infty$
8. $\infty \cdot 0$
9. 0^0
10. 0^∞
11. ∞^0
12. 1^∞

Problem 3

Evaluate the following limits.

1. $\lim_{x \rightarrow 0^+} \frac{1}{x^2} - \cot(x)$
2. $\lim_{x \rightarrow 0^+} x^{\sin(x)}$
3. $\lim_{x \rightarrow 1} x \ln(x)$
4. $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x$

Problem 4

Find the following limits

1. $\lim_{x \rightarrow \infty} x^a - \ln(x)$ for $a > 0$
2. $\lim_{x \rightarrow \infty} x^p e^{-x}$ for any p .