MAC 2311 Hybrid Calculus I

Sections 4.4, 4.7

L’Hopital Rule

Indeterminate Quotients: (0/0, ∞/∞)

1. $\lim\_{x\to 0}\frac{\sqrt{9+3x}-3}{x}=$ 2) $\lim\_{\begin{array}{c}x\to \frac{π}{2}^{-}\end{array}}\frac{1+tanx}{secx}=$

3) $\lim\_{x\to 0}\frac{1-sinx}{cosx}=$ 4) $\lim\_{x\to \infty }\frac{x+cosx}{x}=$

Indeterminate Products: (0\*∞)

5) $\lim\_{x\to \infty }x^{2}sin\left(\frac{1}{4x^{2}}\right)=$

Indeterminate Differences: (∞−∞)

6) $\lim\_{x\to \infty }x-\sqrt{x^{2}-2x}=$

Indeterminate Powers: (00, 1∞, ∞0)

7) $\lim\_{x\to 0^{+}}x^{x}=$

8) $\lim\_{x\to \infty }\left(1+\frac{1}{x}\right)^{x}=$

9) $\lim\_{x\to 0^{+}}\left(cscx\right)^{x}=$

**Optimization**

 1. A farmer with 800 ft. of fencing wants to enclose a rectangular area and then divide it into four pens with fencing parallel to one side of the rectangle. Use Calculus to find the largest possible total area of the four pens. Show that your area is a maximum. Show all your work.

Ans: A=1600sq ft. ; A”(x)=-5 <0, relative max.

2. A company is constructing an open-top, square-based, rectangular metal tank that will have a volume of 4000 cm3. What dimensions yield the minimum surface area? Use the second derivative to check that your answer gives a minimum. Show all your work.

Ans: x=20, y=10; s”(x) =2+ 32000/x3 |x=20 >0, relative min.

3. Find the point (*x*, *y*) on the curve $y=\sqrt{x }$ that is closest to the point (3, 0). Show that you have a minimum. Show all your work. Ans: (5/2, sqrt(5/2)); (d2)”=2 > 0 relative min.

4. A rectangle is to be inscribed in a circle of radius 2. What is the largest area the rectangle can have, and what are the dimensions? Ans: A=8, L=2√(2), w=2√(2)