

## MATH 224

*Hints and Answers for Assignment 23*  
Some Problems Involving Leibniz' Rule

**A:** Prove by contradiction. Suppose

$$\lim_{x \rightarrow a} f(x) = B$$

where  $B < 0$ . Let  $r = |B|/2$  and let  $\mathcal{N}$  be the  $r$ -neighborhood of  $B$ . Show that every number in  $\mathcal{N}$  is negative. Explain why there must be some neighborhood  $\mathcal{M}$  of  $a$  such that if  $x \neq a$  is in  $\mathcal{M}$ , then  $f(x)$  must lie in  $\mathcal{N}$ . Why does this lead to a contradiction?

**B:**

(1)  $F'(x) = 12x$

(2)  $F'(x) = 3$

(3) A direct calculation involves integration by parts. Here  $F'(x) = \frac{e^2 - 1}{2}$ .

**C:.**  $F'(x) = \frac{\sin 12x}{x}$

**D:** Recall that  $\int e^{-xy} dx = \frac{e^{-xy}}{-y}$ .

$$G'(y) = \frac{e^{5y} - e^{-5y}}{y}$$