Class 26 HW SOLUTIONS **to selected problems**. Math 110, Fall 98
Was due Wednesday, 11/11/98: HH, page 133: 1, 7, 9, 15.

1. Graph the function $y = \sin(x)/x$ on your calculater. Then using the trace function, let x approach 0, until $.999 < y < 1$. For example, $-.05 < x < .05$ is close enough.

7. Using the same method as above (graph, then trace), we see that the limit is 1.

9. (a) We want numbers x_1, x_2, $\cdots$, such that $\sin(1/x)$ is zero for all these numbers.

Ask yourself: $\sin(?) = 0$.
Answer: $\sin(n\pi)$, where n can be any integer. So we want $1/x$ to equal $n\pi$.
$1/x = n\pi$, so $x = 1/(n\pi)$.
So one possible answer is: $1/\pi$, $1/(2\pi)$, $1/(3\pi)$, $\cdots$.

(b) Ask yourself: $\sin(?) = 1$.
Answer: $\sin(n\pi/2)$, where $n = 1, 5, 9, 13, \cdots$. So we want $1/x$ to equal $n\pi/2$.
$1/x = n\pi/2$, so $x = 2/(n\pi)$.
So one possible answer is: $2/(1\pi)$, $2/(5\pi)$, $2/(9\pi)$, $\cdots$.

(c) This time we get: $2/(3\pi)$, $2/(7\pi)$, $2/(11\pi)$, $\cdots$.

(d) Parts (a)-(c) show that as x approaches zero, $\sin(1/x)$ takes on each of the values 0, 1, and -1 infinitely many times. In other words, our function is not approaching JUST ONE number. So the limit does not exist.

15. The idea of this problem is to prove that the limit of the product of two functions equals the product of the limits of the functions. And we'd like to prove this assuming the other properties of limits. More precisely, on page 129, we want to prove property 3 by using properties 1 and 2.

HOWEVER, it seems to me that we need to use property 3 to do part (a), so this is *circular reasoning*. So let's skip this problem!