STUDENT NAME:

Calculus 1550, section 20. Tuesday, October 29, 2003. Twentieth quiz

Use L'hopital's rule to find the following limits. 2 points each.

1. $\lim_{x\to\infty} \frac{x^3+1}{2x^3+x}$. $= \lim_{x\to\infty} \frac{3x^2}{6x^2+1} = \lim_{x\to\infty} \frac{6x}{12x} = \lim_{x\to\infty} \frac{6}{12} = \frac{6}{12} = \frac{1}{2}$

l'hopital — l'hopital — cancelation of x — limit of constant is constant.

2. $\lim_{x\to\infty} \frac{e^{3x-1}}{x}$. $= \lim_{x\to\infty} \frac{3e^{3x-1}}{1} = \lim_{x\to\infty} 3e^{3x-1} = \infty$,

here $(3 = (3x-1)')$

l'hopital

since as $x \to \infty$ $3x-1 \to \infty$, and so $e^{3x-1} \to \infty$.

3. $\lim_{x\to 0} \frac{1-\cos(x)}{\sin(x)}$. $= \lim_{x\to 0} \frac{\sin(x)}{\cos(x)} = \lim_{x\to 0} \tan(x) = 0$

l'hopital — "simplification" (or def^n of tan) — fact that if $f(x)$ is continuous at a, then $\lim_{x\to a} f(x) = f(a)$

4. $\lim_{x\to 1} \frac{e^x - e}{x-1}$. $= \lim_{x\to 1} \frac{e^x}{1} = e^1 = e$

l'hopital — if $f(x)$ cont at a, $\lim_{x\to a} f(x) = f(a)$

5. $\lim_{x\to\infty} x^{1/x}$.

for $g(x)^{f(x)}$, take log first: 1) $y = x^{1/x} \Rightarrow \ln y = 1/x \ln x$

2) take limit $\lim_{x\to\infty} \frac{\ln x}{x} = \lim_{x\to\infty} \frac{1/x}{x} = \lim_{x\to\infty} \frac{1}{x^2} = 0$

l'hopital

3) $\ln y \to 0$, so $y = e^{\ln y} \to e^0 = 1$, so $\lim_{x\to\infty} x^{1/x} = 1$