Calculus Quiz

Name _____

Professor _____

1. Find $\dfrac{\mathrm{d}}{\mathrm{d}x}\left(\sin(\cos(\tan x))\right)$.

2. Find $\dfrac{\mathrm{d}}{\mathrm{d}x}\left(\cot(\sec(\csc x))\right)$.

3. Demonstrate that
$$\lim_{n\to+\infty}\frac{1+\frac{1}{2}+\frac{1}{3}+\cdots+\frac{1}{n}}{\log n}=1.$$

4. Prove that $\displaystyle\sum_{n=1}^{+\infty}\frac{1}{n^4}=\frac{\pi^4}{90}=\frac{8}{45}\cdot\left(\int_0^{+\infty}\frac{\sin x}{x}\mathrm{d}x\right)^4$.

5. Prove that $\displaystyle\prod_{n=2}^{+\infty}\frac{n^3-1}{n^3+1}=\frac{2}{3}$.

6. Write out
$$\sum_{\substack{1\le j\le 2\\ 1\le j\le 3\\ 1\le k\le 2}} a_{ij}b_{jk}c_{ki}$$
completely.