Math 235 Fall 2000
Quiz 1 (Diagnostic) 8/30   Name: _____

This is a diagnostic quiz only; you will get 20 points for taking this quiz no matter what your
score turns out to be. I'm trying to get an idea of what your backgrounds are; the information
on this diagnostic quiz is *not* representative of what you have to know to take this class. (In
particular, if you have not had calculus before, you may not know what to do for problems 7-10.)
NO CALCULATORS.

1. Factor $x^3 - 2x^2 - 3x - 6$ as much as possible.

2. Factor $x^5 - 1$ as much as possible.

3. Simplify the following until there is only one h in the expression: $\dfrac{\frac{1}{x+h} - \frac{1}{x}}{h}$.

4. Suppose $f(x)$ is a polynomial function. What characteristics *must* the graph of $f(x)$ have?
(List as many as you can think of.)

5. Calculate $\sin\left(\dfrac{\pi}{3}\right)$.

6. If $f(x) = x^2 - 1$ and $g(x) = \dfrac{1}{x}$, what is $f(g(2x) + 1)$?

7. Calculate $\dfrac{d}{dx}(3x^2 + 2x + 1)$.

8. Calculate $\dfrac{d}{dx}(x^2 \sin(x^2))$.

9. Calculate $\displaystyle\int (x^2 + 1)\, dx$.

10. Calculate $\displaystyle\int_1^2 xe^{x^2}\, dx$.

11. Twenty-four red socks and 24 blue socks are lying in a drawer in a dark room. What is the minimum number or socks you must take out of the drawer in order to guarantee that you will have at least two socks of the same color?

12. Two American coins add up to thirty cents, yet one of them is not a nickel. What coins are they?

13. On the island of Wibble, every inhabitant of the island is either a knight or a knave. Knights always tell the truth, and knaves always lie; your job is to tell who is who. Suppose Alex and Bob (two inhabitants of the island) meet you in the garden, and Alex says "Either I am a knave, or Bob is a knight." What are Alex and Bob?

The last three problems are taken from Smullyan's book entitled "What is the Name of this Book?"