NAME_____ ID_____

MATHEMATICS 249 MIDTERM Fall 2002

SHOW ALL WORK. Marks for each problem are to the left of the problem number.
NO CALCULATORS PLEASE.

[4] 1. Find $\lim_{x\to\infty}\left(\frac{4+x^2}{1+4x^2}\right)$.

[4] 2. Find $\lim_{x\to 6^+}\left(\frac{x-8}{x-6}\right)$.

[5] 3. Find and simplify $\lim_{x \to 1} \left(\dfrac{2x - \sqrt{5 - x}}{x - 1} \right)$.

[5] 4. Find and simplify $\dfrac{d}{dx} \left(\dfrac{\sqrt{x}}{x + \cos x} \right)$.

[5] 5. Find and simplify $\dfrac{d}{dx}\left(\sin^2(2x^2 - x)\right)$.

[5] 6. Find and simplify $\dfrac{d}{dx}\left((14x - \tan 3x)^{5/2}\right)$.

[5] 7. USE THE DEFINITION OF DERIVATIVE to find $\frac{d}{dx}\left(\frac{1}{1-x}\right)$.

[6] 8. Find the equation of the tangent line to the graph of $y = 12x - 5x^3$ at the point where $x = 1$.

[5] 9. Use implicit differentiation to find and simplify dy/dx where $x^3 + y^2 = 5xy + 8$.

[6] 10. An object moves along a straight line so that its position (in metres) at any time t (in seconds) is given by the function $p(t) = t(3t - 7)^6$. Using any method you like, find the instantaneous velocity (in metres per second) of the object at time t. At which time(s) is the velocity of the object equal to zero?

[50]