Name: _____

4-digit code: _____

- Write your name and the last 4 digits of your SSN in the space provided above.

- The test has six (6) pages, including this one.

- Enter your answers in the boxes provided.

- You must show sufficient work to justify all answers unless otherwise stated in the problem. Correct answers with inconsistent work may not be given credit.

- Credit for each problem is given in parentheses at the right of the problem number.

- No books, notes or calculators may be used on this test.

Page	Max. points	Your points
2	20	
3	20	
4	20	
5	20	
6	20	
Total	100	

Problem 1 (5 pts—all or nothing). Find the domain of $f(x) = \sqrt{(1-x)(2-x)}$.

$$\text{domain} = \boxed{}$$

Problem 2 (5 pts—all or nothing). Let $f(x) = x^2 + 4$, $g(x) = \sqrt{x}$. Find $g \circ f$

$$(g \circ f)(x) = \boxed{}$$

Problem 3 (5pts). Evaluate the following limit:

$$\lim_{n \to \infty} \sum_{k=1}^{n} \frac{5k}{n^2}$$

$$\boxed{}$$

Problem 4 (5 pts). Assume y is a function of x given implicitly by $\sin(x+y) = x + y$. Find y'.

$$\boxed{}$$

Problem 5 (10 pts). Use logarithmic differentiation to find the derivative of the function

$$y = \frac{\tan^2 x \sin^4 x}{e^{3x}(x^2+1)}$$

$y' = $

Problem 6 (10 pts). Find an equation of the tangent line to the curve $y = \ln(xe^x)$ at the point $(1,1)$.

Problem 7 (20 pts)**.** Sketch the graph of the rational function $f(x) = \dfrac{x^2}{1 - x^2}$.

　　Indicate clearly: Domain; x- and y-intercepts; vertical and horizontal asymptotes; intervals of increase, decrease and different concavity. Indicate also the location of relative extrema, if any.

Problem 8 (10 pts)**.** The volume of a cube is increasing at a rate of 300 cm^3/min. How fast are the edges increasing when the length of an edge is 10 cm?

The edges are increasing at a speed of

Problem 9 (10 pts)**.** A farmer wants to fence an area of 1.5 million square feet in a rectangular field and then divide it in half with a fence parallel to one of the sides of the rectangle. How can he do this so as to minimize the cost of the fence?

Dimensions of most economic fence:

Problem 10 (1/2/3/4 pts). Compute the following limits:

(a) $\lim\limits_{x \to -\infty} \dfrac{x^2 - 2x - 8}{x^2 - 4} =$

(b) $\lim\limits_{x \to 2} \dfrac{x^2 + 2x - 8}{x^2 - 4} =$

(c) $\lim\limits_{x \to -2} \dfrac{x^2 - 2x - 8}{x^2 - 4} =$

(d) $\lim\limits_{x \to 0} x^{1/x} =$

Problem 11 (3/3/4 pts). Evaluate each integral:

(a) $\displaystyle \int \left(\tfrac{1}{x} - 2^x \right) dx =$

(b) $\displaystyle \int \left(3 \sin x - 2 \cos x \right) dx =$

(c) $\displaystyle \int_1^2 \left(5x + \dfrac{2}{3x^5} - \sqrt{2}e^x \right) dx =$