Name:	_____
VIP ID:	_____

- Write your name and VIP ID in the space provided above.

- This test has three (3) pages, including this one.

- You have seventy-five (75) minutes to complete both tests.

- Enter your answer in the box(es) 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.

- 20% of this test is obtained from the optimization problem in Test#4.

- No books or notes may be used on this test. You may use a calculator, if you want.

Page	Max. points	Your points
2	40	
3	40	
Test#4	20	
Total	100	

Problem 1 (20 pts). Find the critical values of the function $h(x) = \dfrac{x-2}{x^2+1}$. Indicate whether they are local maxima, local minima, or neither.

Problem 2 (10 pts). Find an equation of the normal line to the curve $y = \sin x + \sin^2 x$ at the point $(0,0)$

$$y = \boxed{}$$

Problem 3 (10 pts). The curve with equation $y^2 = x^3 + 3x^2$ is called the **Tschirnhausen cubic**. At what points does this curve have horizontal tangents?

$$\boxed{}$$

Problem 4. *Compute the following limits:*

[10 pts] $\lim\limits_{x \to 0^+} x \ln(x) =$ ☐

[10 pts] $\lim\limits_{x \to \infty} \dfrac{1 - x - x^2}{5x^2 - 9} =$ ☐

[10 pts] $\lim\limits_{x \to \infty} \left(1 - \dfrac{3}{x}\right)^{4x} =$ ☐

[10 pts] $\lim\limits_{x \to \infty} x^{1/x} =$ ☐