

Name: _____

4-digit code: _____

- Write your name and the last 4 digits of your SSN in the space provided above.
- The test has five (5) pages, including this one.
- You have fifty (50) minutes to complete the exam.
- 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.
- No books, notes or calculators may be used on this test.

Page	Max. points	Your points
2	30	
4	20	
5	20	
6	30	
Total	100	

Problem 1 (10 pts). Find the equation of the tangent lines to the curve $y = (\ln x)/x$ at the points $(1, 0)$ and $(e, 1/e)$.

 $y =$ $y =$

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

 $y =$

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?

Problem 4 (10 pts). Find the critical values of the function $h(x) = \frac{x-2}{x^2+1}$. You **do not** have to indicate whether they are local maxima, local minima, or neither.

Problem 5 (10 pts). Find the absolute extrema of the function $f(x) = x^3 - 3x + 1$ on the interval $[-3, 0]$.

$$M =$$
$$m =$$

Problem 6 (20 pts). Find the global extrema of the function $f(x) = x^2/(x - 2)$ on the interval $(2, 5]$. If any of the extrema does not exist, indicate so.

 $M =$ $m =$

Problem 7. *Compute the following limits:*

$$[5 \text{ pts}] \lim_{x \rightarrow 0^+} x \ln(x) = \boxed{}$$

$$[5 \text{ pts}] \lim_{x \rightarrow \infty} \frac{1 - x - x^2}{5x^2 - 9} = \boxed{}$$

$$[10 \text{ pts}] \lim_{x \rightarrow \infty} \left(1 - \frac{3}{x}\right)^{4x} = \boxed{}$$

$$[10 \text{ pts}] \lim_{x \rightarrow \infty} x^{1/x} = \boxed{}$$