NAME _____

STUDENT ID _____

RECITATION INSTRUCTOR _____

RECITATION TIME _____

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DIRECTIONS

1. Write your name, student ID number, recitation instructor's name and recitation time in the space provided above. Also write your name at the top of pages 2, 3 and 4.
2. The test has four (4) pages, including this one.
3. Write your answers in the boxes provided.
4. 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.
5. Credit for each problem is given in parentheses in the left hand margin.
6. No books, notes or calculators may be used on this exam.

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(10) 1. Use the second derivative test to determine the relative maximum and minimum values (if any) of the function $g(x) = x^4 - 8x^2 + 1$. Give your answers in the form: "$g(a) = b$ is a rel. max (or min)."

(6) 2. (a) $\lim_{x \to -\infty} e^{-\frac{1}{x}} =$ ☐ (b) $\lim_{x \to \infty} \frac{1}{\ln x} =$ ☐

Answers only. No reason necessary.

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(10) 3. Let $f(x) = 3x^5 - 5x^3$.

(a) Find a point c such that $f'(c) = f''(c) = 0$.

$c =$

(b) Circle the letter of the correct statement and give the reason for your answer.

A. f has a relative extreme value at c.

B. f does not have a relative extreme value at c.

Reason:

(12) 4. Let $f(x) = \dfrac{x}{x^2 - 1}$.

(a) Find the inflection points (x, y) (if any) of the graph of f.

(b) Find the vertical and horizontal asymptotes (if any) of the graph of f.

Vertical asymptote(s):

Horizontal asymptote(s):

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(12) 5. A right triangle is formed by the coordinate axes and the line through the point $(2, 5)$, as shown in the figure below. Find the value of x for which the area of the triangle is minimum.

$x =$

(6) 6. Approximate $\int_0^2 \sin(\pi x)dx$ using the midpoint Riemann sum with the partition $P = \{0, \frac{1}{2}, 1, 2\}$.

(8) 7. Find the derivative of the function

$$G(y) = \int_y^{y^2} (1 + t^2)^{\frac{1}{2}} dt.$$

$G'(y) =$

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(8) 8. $\int_0^{\pi} (\sin x - 2e^x) dx =$

(12) 9. (a) $\int \frac{\ln z}{z}\, dz =$

(b) $\int x\sqrt{x+2}\, dx =$

(8) 10. Find the area of the region between the graph of the function $f(x) = \frac{x}{x^2+1}$ and the x-axis on the interval $[0, 1]$.

(8) 11. Set up a definite integral for the area of the region enclosed by the graphs of the functions $f(x) = x^2 + 1$ and $g(x) = 2x + 9$. Do not evaluate the integral.

$A =$