Math 119 Departmental Final Exam
Thursday, December 6th, 8:00-10:00am

Student’s Name________________________________________

Student’s ID Number or net ID __________________________

Instructor’s Last Name _________________________________

Math 119 CRN Number ______________________________

Instructions: No Calculators allowed!

Do not ask questions during the exam. The proctors will not answer questions similar to the following: “Am I doing this right?” “Can you give me a hint?” “What does this mean?” If you have a photocopy issue and are unable to read something, then ask a proctor. Otherwise, do not cause a disturbance during the exam.

Show work whenever possible! Full credit will be awarded for correct answers with supporting work. Write your answers in the boxes provided. (You do not need to show work for multiple choice problems.)

No scrap paper allowed. If more room is needed to show work for a problem, use the back of the page.

Simplify all answers. Fractional answers should be reduced but not written as mixed numbers.

Read and Sign Below.
The Honor Statement
An essential feature of the University of Tennessee is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the University, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity.

Pledged________________________________________
Problems 1-10 are worth 2 points each. Write the letter of your answer in the box provided.

1. Rewrite $\log_{16} 4 = \frac{1}{2}$ in exponential form.
   
   a. $\left(\frac{1}{2}\right)^{16} = 4$  
   b. $16^4 = \frac{1}{2}$  
   c. $4^{\frac{1}{2}} = 16$  
   d. $16^{\frac{1}{2}} = 4$  
   e. none of these

2. A company has a cost equation given by $C(x) = 100 + 30x$ and a revenue equation given by $R(x) = 90x - x^2$. Write the profit equation for this company.
   
   a. $P(x) = -x^2 + 60x - 100$  
   b. $P(x) = -x^2 + 120x - 100$  
   c. $P(x) = x^2 - 60x + 100$  
   d. $P(x) = -x^2 - 60x + 100$  
   e. none of these

3. Which number is NOT an integer?
   
   a. 0  
   b. $\sqrt{36}$  
   c. $-\frac{9}{2}$  
   d. 15  
   e. none of these

4. Find the least common denominator of the fractions in the equation $\frac{x}{x^2 - 4} + \frac{1}{x + 2} = 3$.
   
   a. $(x - 2)(x + 2)$  
   b. $(x + 2)$  
   c. $(x - 2)(x + 2)^2$  
   d. $(x - 2)$  
   e. none of these

5. Simplify: $8 + 32 \div 4 \cdot 2 - 2$
   
   a. 10  
   b. 22  
   c. 18  
   d. 3  
   e. none of these
6. Which line is perpendicular to $-4x + y = -2$?
   a. $y = 4x + 6$
   b. $y = -4x - 20$
   c. $y = \frac{1}{4}x + 16$
   d. $y = -\frac{1}{4}x - 8$
   e. none of these

7. Find the horizontal asymptote of $y = 2^{x+7} + 3$.
   a. $x = 3$
   b. $x = -7$
   c. $y = 3$
   d. $y = -7$
   e. none of these

8. Rewrite $\sqrt[3]{x^2}$ in rational exponent form.
   a. $x^{-2/3}$
   b. $x^{3/2}$
   c. $x^6$
   d. $x$
   e. none of these

9. Let $h(x) = \frac{1}{4}x^2 - 4x + 8$. Is the vertex of $h(x)$ a minimum or maximum point, and is the graph of $h(x)$ narrower or wider than the graph of $y = x^2$?
   a. minimum; narrower
   b. minimum; wider
   c. maximum; narrower
   d. maximum; wider
   e. none of these

10. Which of the following expressions is equivalent to $\frac{5x^2 - 2x + 9}{x}$?
    a. $5x - 2 + 9x^{-1}$
    b. $5x^2 - 2x + 9 + x^{-1}$
    c. $5x^2 + 7$
    d. $3x + 9$
    e. none of these
Problems 11-30 are worth 4 points each. Show work for partial credit. Write the answer in the box provided.

11. a. Write \([0, 5)\) in inequality notation.  
b. Sketch \([0, 5)\) on the real number line.

12. Factor \(3x^3 + x^2 + 15x + 5\).

13. Let \(f(x) = 2x + 1\) and \(g(x) = x^2 - 2\), find:
   a. \((f + g)(5)\)  
b. \((fg)(x)\)

14. Graph \(g(x) = -x^2 + 2\) using transformations.
15. Evaluate:
   a. $9^{1/2}$
   b. $5^{-3}$
   c. $\log(10)$
   d. $\ln(e^{-4})$


17. Solve for $x$, $\log_4(x+1) - \log_4(x-1) = 2$.

18. Complete the table for the equation: $y = \log_2(x)$. Use the resulting points to graph the equation.

<table>
<thead>
<tr>
<th>$x$</th>
<th>$\frac{1}{2}$</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
19. 56 is what percent of 140?

20. a. Simplify \( \frac{x^2 - 2x - 3}{x^2 - 9} \).

   b. State the domain restrictions.

21. Find the equation of the line, in slope-intercept form, which passes through the point (1, -8) and has a slope of 3.

22. Solve for \( x \), \( e^{4x-4} = e^{x^2} \).

23. Simplify \( \left( \frac{x^3 y^{-1}}{2x^{-6}} \right)^4 \), leaving positive exponents.
24. Find the difference quotient \( \frac{f(x+h) - f(x)}{h}, h \neq 0 \) and simplify your answer, \( f(x) = 3x + 5 \).

\[
\frac{3(2+x) - 3x}{2-x}
\]

25. Solve for \( x \) and write your answer in interval notation, \( \frac{x+7}{-2} \leq 1 \).

26. Find two functions \( f \) and \( g \) such that \( h(x) = (f \circ g)(x) \). (You may not use \( f(x) = x \) or \( g(x) = x \) as either of your answers.)

\[
h(x) = \frac{3}{2-x}
\]

\[
f(x) = \quad g(x) =
\]

27. Let \( g(x) = -3x^2 + 29 + 4x^{11} - 15x^5 \).

a. Write \( g(x) \) in standard form.

b. What is the degree and leading coefficient of \( g(x) \)?

\[
\text{degree} =
\]

\[
\text{leading coefficient} =
\]

c. What is the left end behavior and right end behavior of \( g(x) \)?
28. Translate the following into a system of equations. Be sure to clearly define your variables. (Do not solve.)

You have 24 quarters and dimes in your pocket that are worth $4.50. How many of each type of coin do you have?

Variables:  

System of Equations:

29. Evaluate the piecewise function at each specified value \( f(x) = \begin{cases} 3x - 1 & \text{if } x < -1 \\ 2x + 3 & \text{if } x \geq -1 \end{cases} \)

a. \( f\left(-\frac{4}{3}\right) \)  
b. \( f(0) \)

30. Describe the increasing, decreasing, and constant behavior of the function. Write none if applicable.

Increasing =  
Decreasing =  
Constant =