MATH 1100
Common Final Exam

FALL 2007
December 7, 2007

PLEASE PRINT THE FOLLOWING INFORMATION:

Name: ___________________________  Instructor: ___________________________

Student ID: ___________________________  Section/Time: ___________________________

The exam consists of 40 multiple choice questions. As with many standardized tests, a
special answer sheet is provided so that your answers can be computer graded. You must
use a pencil with a soft black lead (#2 or HB) to complete the answer sheet. Be sure to
completely fill in the space that corresponds to your answer choice. If you change your
mind, completely erase any stray marks. (If you mark two or more answers
corresponding to a single problem, then that problem is counted as incorrect.) YOU ARE
NOT PENALIZED FOR GUESSING. You may perform calculations by writing on the
test – not on the answer sheet. You will only receive credit for properly marking the
answer sheet. MAKE SURE THAT YOUR NAME APPEARS ON THE ANSWER
SHEET IN THE SPACES PROVIDED FOR THIS PURPOSE.

QUESTIONS BEGIN ON PAGE 1 AND ARE ON THE FRONT AND BACK OF
EACH PAGE FOLLOWING THIS COVER PAGE.
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1. Solve the following equation $8x^2 + 10x = 3$

(a) $\{3, 1\}$
(b) $\{3, -4\}$
(c) $\{-8, 3\}$
(d) $\left\{\frac{3}{2}, \frac{1}{4}\right\}$
(e) $\{-3, 8\}$

2. Simplify the expression $\frac{x^3y^{-2}}{(x^{-2}y^3)^{-2}}$.

(a) $\frac{1}{x^2y^4}$
(b) $\frac{x}{y^4}$
(c) $\frac{y^4}{x}$
(d) $\frac{x^7}{y^3}$
(e) $\frac{x^7}{y^4}$

3. Solve the equation $x - 3 \left(2 - \frac{4}{5}x\right) = \frac{1}{2}x$ for $x$:

(a) $x = \frac{60}{29}$
(b) $x = -\frac{60}{19}$
(c) $x = \frac{12}{7}$
(d) $x = \frac{6}{29}$
(e) No solution
4. Factor $81x^2 - 25y^2$.
   
   (a) $(81x - 25y)(81x + 25y)$
   (b) $(9x + 5y)^2$
   (c) $(9x - 5y)^2$
   (d) $(9x + 5y)(9x - 5y)$
   (e) The polynomial cannot be factored.

5. The graph of $f(x) = x^3$ is modified by shifting left 2 units and then down 1 unit. What function gives this modification (new graph)?
   
   (a) $(x + 2)^3 - 1$
   (b) $(x - 2)^3 + 1$
   (c) $(x - 2)^3 - 1$
   (d) $(x - 1)^3 - 2$
   (e) $x^3 - 1$

6. One of the factors of $6x^2 + 19x - 7$ is.
   
   (a) $(2x - 7)$
   (b) $(3x + 1)$
   (c) $(6x - 7)$
   (d) $(3x - 1)$
   (e) $(x - 7)$

7. Simplify the expression $\frac{x^2 - 9}{x^2 - 4x - 12} \div \frac{x^2 - 5x + 6}{x^2 - 4}$.
   
   (a) $\frac{(x + 3)(x - 3)^2}{(x - 6)(x + 2)^2}$
   (b) $\frac{x - 6}{x + 3}$
   (c) $(x + 3)(x - 6)$
   (d) $\frac{x + 3}{x - 6}$
   (e) does not exist
8. Simplify the complex rational expression \( \frac{9 + \frac{x}{3}}{x + \frac{1}{3}} \).

(a) \( \frac{9}{x} \)
(b) 36
(c) \( \frac{x}{36} \)
(d) 1
(e) \( x \)

9. The solution set to the equation \(|8x + 4| + 3 = 11\) is

(a) \{ -3, 1 \}
(b) \{ \frac{-1}{2}, \frac{3}{2} \}
(c) \{ \frac{-3}{2}, \frac{1}{2} \}
(d) \{ \frac{1}{2} \}
(e) No solution

10. Solve the equation \( \frac{1}{x-1} - \frac{1}{x+1} = 1 \).

(a) \( x = \sqrt{3} \)
(b) \( x = -\sqrt{3} \)
(c) \( x = -\sqrt{3}, \sqrt{3} \)
(d) \( x = 1 \)
(e) \( x = -1 \)

11. Find the distance between the points \( A(2, 3) \) and \( B(-1, -1) \).

(a) 1
(b) 2
(c) 3
(d) 4
(e) 5
12. Find the asymptotes of the function \( f(x) = \frac{3x}{2(x + 1)} \).
   
   (a) horizontal asymptote at \( y = \frac{2}{3} \), vertical asymptote at \( x = 1 \).
   
   (b) horizontal asymptote at \( y = 0 \), vertical asymptote at \( x = -1 \).
   
   (c) horizontal asymptote at \( y = \frac{3}{2} \), vertical asymptote at \( x = 1 \).
   
   (d) horizontal asymptote at \( y = \frac{3}{2} \), vertical asymptote at \( x = -1 \).
   
   (e) vertical asymptote at \( x = -1 \), no horizontal asymptote.

13. If one finds roots of the function \( f(x) = 2x^3 - 5x^2 + x + 2 \) and adds them together one obtains
   
   (a) 3
   (b) 2
   (c) \(-1\)
   (d) \(\frac{5}{2}\)
   (e) \(\frac{3}{2}\)

14. Find the zeros of the polynomial function, and give multiplicity of each zero. State whether the graph crosses or touches the \( x \)-axis at each zero. \( f(x) = \left( \frac{1}{8000} \right) (x - 300)^2 (x + 200) \).
   
   (a) \( x = -300 \) has multiplicity of 1; graph crosses the \( x \)-axis
   \( x = 200 \) has multiplicity of 2; graph crosses the \( x \)-axis
   
   (b) \( x = 300 \) has multiplicity of 2; graph touches the \( x \)-axis
   \( x = -200 \) has multiplicity of 1; graph crosses the \( x \)-axis
   
   (c) \( x = 300 \) has multiplicity of 1; graph crosses the \( x \)-axis
   \( x = 200 \) has multiplicity of 2; graph crosses the \( x \)-axis
   
   (d) \( x = -300 \) has multiplicity of 1; graph crosses the \( x \)-axis
   
   (e) \( x = 200 \) has multiplicity of 2; graph crosses the \( x \)-axis
15. Find all $x$ which satisfy $-6 < 3 - 2x \leq 4$.
   
   (a) $\left( -\frac{1}{2}, \frac{9}{2} \right]$
   
   (b) $\left[ -\frac{1}{2}, \frac{9}{2} \right)$
   
   (c) $\left( -\frac{1}{2}, \frac{9}{2} \right)$
   
   (d) $(-\infty, -\frac{1}{2})$
   
   (e) $(-\infty, -\frac{1}{2}) \cup \left[ \frac{9}{2}, +\infty \right)$

16. Solve for $x : x^2 + x - 12 < -6$
   
   (a) $(-2, 3)$
   
   (b) $(2, +\infty)$
   
   (c) $(-\infty, -3)$
   
   (d) $(-3, 2)$
   
   (e) No solution

17. Find an equation of the line passing through the points $(-3, 4)$ and $(2, -5)$.
   
   (a) $y - 5 = -\frac{9}{5} (x - 2)$
   
   (b) $y = x - 7$
   
   (c) $y + 5 = -\frac{5}{9} (x - 2)$
   
   (d) $y = x + 7$
   
   (e) $y + 5 = -\frac{9}{5} (x - 2)$

18. Which of the following values is not in the domain of the function $g(x) = \sqrt{1 - 2x}$.
   
   (a) 0
   
   (b) $-1$
   
   (c) 1
   
   (d) $-1/2$
   
   (e) All of these values are in the domain of $g$. 
19. Solve the given formula \( A = \frac{1}{2}h(a + b) \) for the variable \( b \).

(a) \( b = \frac{2A - ha}{h} \)
(b) \( b = A - ha \)
(c) \( b = \frac{2A + ha}{a} \)
(d) \( b = A + ha \)
(e) \( b = \frac{1}{2}h(A + a) \)

20. Solve the radical equation \( \sqrt{3x + 18} = x \)

(a) There is one solution and it is positive
(b) There is one solution and it is negative
(c) There are two solutions, both positive
(d) There are two solutions, one negative and one positive
(e) There is no solution.

21. Solve for \( x \): \( \log_{10}(1 - 2x) = 2 \)

(a) \( x = -\frac{99}{2} \)
(b) \( x = -9 \)
(c) \( x = \frac{1 - \log_{10}2}{2} \)
(d) \( x = \frac{1 - 2^{10}}{2} \)
(e) \( x = \frac{1}{2} - \frac{1}{\log_{10}} \)
22. Solve the logarithmic equation \( \log x + \log (x - 3) = 1 \).

(a) \( x = \frac{2 \pm \sqrt{13}}{3} \)
(b) \( x = -2 \)
(c) \( x = \frac{3 \pm \sqrt{13}}{2} \)
(d) \( x = 5 \) and \( x = -2 \)
(e) \( x = 5 \)

23. Given \( f(x) = 2x^2 + 3 \) and \( g(x) = x - 2 \), and \( h(x) = g \circ f(x) \), we have \( h(2) = \)

(a) 12
(b) 3
(c) 9
(d) 0
(e) -9

24. The vertex for the graph of \( y = 2x^2 + x + 4 \) is at the point

(a) \( \left( -\frac{1}{4}, \frac{31}{8} \right) \)
(b) \( x = -\frac{1}{4} \)
(c) \( (0, 4) \)
(d) \( (1, 6) \)
(e) a vertical line.

25. The length of a rectangular picture frame is 3 inches longer than its width. If the area of the frame is 270 square inches, what are the dimension of the frame?

(a) 12 inches by 15 inches
(b) 9 inches by 30 inches
(c) 15 inches by 18 inches
(d) 18 inches by 21 inches
(e) None of these
26. Find the accumulated value of an investment if $2000 is invested at 11% compounded monthly for 5 years. Round to nearest cent.

   (a) $3440.86
   (b) $3466.51
   (c) $3370.12
   (d) $3457.83
   (e) $5502.30

27. How long, to the nearest tenth of a year, will it take $1000 to grow to $3600 at 8% annual interest compounded continuously?

   (a) 15.5 years
   (b) 16.6 years
   (c) 16 years
   (d) 19 years
   (e) 17.5 years

28. Solve the exponential equation \(2^{x-4} = \left(\frac{1}{8}\right)^{-x}\)

   (a) \(x = 2\)
   (b) \(x = -4\)
   (c) \(x = -2\)
   (d) \(x = \frac{1}{8}\)
   (e) \(x = 4\)

29. What is the \(y\) value of the ordered pair of the solution of the system of equations

\[
\begin{align*}
3x - 2y &= -5 \\
4x + y &= 8
\end{align*}
\]

   (a) \(y = 4\)
   (b) \(y = 1\)
   (c) \(y = 0\)
   (d) \(y = -1\)
   (e) \(y = -4\)
30. The force $F$ of the wind on a window varies directly with the square of the speed, $w$, of the wind. The force on the window is 100 lbs when the wind is blowing at 25 mph. What is the force when the wind is blowing at 75 mph?

(a) 400  
(b) 900  
(c) 175  
(d) 10,000  
(e) 625

31. Which of the following functions might have the given graph?

![Graph Image]

(a) $f(x) = x^2 - 2x + 2$  
(b) $f(x) = \frac{1}{30} (x^4 - 7x^3 - 68x^2 + 48x + 576)$  
(c) $f(x) = -x^3 + 3x + 2$  
(d) $f(x) = \frac{1}{5} (x^3 - 2x^2 + x + 2)$  
(e) $f(x) = x^4 + x^3 + x^2 + 2x$

32. $2x^4 - 3x^3 + 5x^2 - 9$ is divided by $x^2 - 2x + 1$. The remainder is

(a) $9x - 14$  
(b) $2x^2 + x + 5$  
(c) $x^2 - 2x + 1$  
(d) $x - 10$  
(e) $-5$
33. Solve for \( x : 5^x = 7 \) (round off to three decimal places).

(a) \( x = 1.400 \)
(b) \( x = 1.209 \)
(c) \( x = 1.946 \)
(d) \( x = 0.389 \)
(e) \( x = 4.349 \)

34. Solve the inequality \(|1 - 4x| - 7 < -2\)

(a) \(-1 < x < \frac{3}{2}\)
(b) \(1 < x < \frac{3}{2}\)
(c) \(2 < x < 4\)
(d) \(-1 < x < \frac{5}{2}\)
(e) \(1 < x < \frac{5}{2}\)

35. Given the piecewise function \( f(x) = \begin{cases} 
- (x + 3) & \text{if } x < -3 \\
 x + 3 & \text{if } x \geq -3
\end{cases} \).

What is \( f(-4) + f(0) \)?

(a) 2
(b) -2
(c) -4
(d) 0
(e) 4

36. Find the center and radius of the circle with equation \( x^2 + 6x + y^2 - 4y + 4 = 0 \).

(a) center \((3, -2)\); radius 3
(b) center \((3, -2)\); radius 9
(c) center \((-6, 4)\); radius 4
(d) center \((-3, 2)\); radius 6
(e) center \((-3, 2)\); radius 3
37. Which of the following functions is the inverse function of \( f(x) = \frac{3}{x} + 4 \)?

(a) \( f^{-1}(x) = \frac{x}{3} + \frac{1}{4} \)

(b) \( f^{-1}(x) = -\frac{3}{x} - 4 \)

(c) \( f^{-1}(x) = \frac{x}{3 + 4x} \)

(d) The inverse function does not exist

(e) \( f^{-1}(x) = \frac{3}{x - 4} \)

38. Find and simplify the difference quotient \( \frac{f(x + h) - f(x)}{h} \) for the given function \( f(x) = 2x^2 \).

(a) \( 4x + 2h \)

(b) \( 2x^2 + 4h \)

(c) \( 4x^2 + 4h^2 \)

(d) \( 4x - 2h \)

(e) \( 2x + 4h \)

39. An automobile has a price of $12,000 after being discounted 20%. What is the original price?

(a) $16,000

(b) $15,000

(c) $14,000

(d) $18,000

(e) $20,000

40. If one computes \( \log_4 8 \) one obtains

(a) 1

(b) \( \frac{1}{2} \)

(c) \( \frac{3}{2} \)

(d) 2

(e) .903