Math 1031, College Algebra & Probability
Fall Semester 2011, Final Examination

Name(Print):_________________________ Signature:_________________________
Recitation T.A.:_____________________ Section#:_________________________I.D.#_________

- Exam Duration: 3 hours
- Closed Book, Closed Notes
- Use of Scientific Calculator (Only) Allowed
- Exam is 19 pages, Please check that you have a complete exam
- Exam is composed of two parts

Part I .. Multiple Choice Problems:
Test consists of 20 multiple choice questions worth 5 points each. There is only one correct answer for each question! The incorrect answer, or multiple answers for a problem will receive zero points. These problems are machine graded, therefore you will use a “bubble” sheet for your answer selections. As you complete each problem, circle your answer selection in this test booklet, and also fill in the appropriate bubble on the answer sheet. You must use a soft pencil on the bubble sheet.

Part II .. Word (Hand Graded) Problems:
Test consists of 7 problems that will be graded by a member of the faculty. The point value of these problems varies by problem, but the sum is 100 points. Each problem solution must show enough work to justify the final answer, which you should neatly circle or box in. A correct answer without any justification will only receive 20% of the possible points for that problem! An incorrect answer may receive partial credit if the grader so chooses.

At this time:
Please put your university ID card out for the exam proctors to view.
Please fill in the the student and class information on the bubble sheet.

After you finish both parts of the exam:
Print your name on each page of the exam.
Place the bubble answer sheet between two pages of this booklet.
Have your ID card in your hand when handing in your exam.

Exam Scores:
Hand Graded Scores

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Multiple Choice Part:———/100 pts
Hand graded Part:———/100 pts
Total:———/200 pts
Part I ... Multiple Choice Problems: 

1. Simplify: \( \left( \frac{3x^2y}{4a^{-1}b^{-3}} \right)^{-1} \)

   a) \( \frac{4}{3ab^3x^2y} \)
   b) \( \frac{1}{12ab^3x^2y} \)
   c) \( 12ab^3x^2y \)
   d) \( \frac{4ab^3}{3x^2y} \)

2. Which equation best describes the graph below?

   (a) \( f(x) = -\sqrt{(x + 1)} + 2 \)
   (b) \( f(x) = -\sqrt{(x - 1)} + 2 \)
   (c) \( f(x) = -\sqrt{(x + 1)} - 2 \)
   (d) \( f(x) = -\sqrt{(x - 1)} - 2 \)
3. Use the properties of logs to simplify: $\log_4(4x^2)$ for $x > 0$.

a) $1 + 2\log_4 x$
b) $2(\log_4 4)(\log_4 x)$
c) $2(\log_4 4x)$
d) $2 + 2\log_4 x$
e) None of the above

4. A state’s automobile license plates consists of 3 letters followed by 3 numerals. Repeats are allowed in both the letters and the numerals, however the letters O (oh) and I (eye) cannot be used.

How many different license plates are possible with this scheme?

a) $26^3 \cdot 10^3$
b) $26 \cdot 25 \cdot 24 \cdot 10 \cdot 9 \cdot 8$
c) $24^3 \cdot 10^3$
d) $24 \cdot 23 \cdot 22 \cdot 10 \cdot 9 \cdot 8$
5. How many liters of a 60% acid solution must be added to 14 liters of a 10% acid solution to produce a 25% acid solution

a) 1.5 liters  
b) 6.0 liters  
c) 8.5 liters  
d) 11 liters

6. Which of the following equations best represents the line passing through (4, 2) and is perpendicular to $4y - 3x = 1$?

(a) $y - 2 = \frac{3}{4}(x - 4)$  
(b) $y - 2 = -\frac{3}{4}(x - 4)$  
(c) $y - 2 = \frac{4}{3}(x - 4)$  
(d) $y - 2 = -\frac{4}{3}(x - 4)$
Part I ... Multiple Choice Problems:  

7. Solve for $x$: $\ln(5 - 2x) = k$
   
   a) $\frac{5}{2} - \frac{1}{2}e^k$
   b) $2 + 5\ln k$
   c) $5 - 2e^k$
   d) $5 - 2\ln k$
   e) $\frac{1}{2} - \frac{5}{2}e^k$

8. Two fair dice are rolled. What is the probability that the numbers showing on the top faces are equal or that their sum is 8?
   
   a) $\frac{1}{6}$
   b) $\frac{7}{36}$
   c) $\frac{11}{36}$
   d) $\frac{11}{36}$
9. Match the graph of \( f(x) \) pictured below with the graph of \( g(x) = f^{-1}(x) \).
Part I ... Multiple Choice Problems: Name(Print):_________

10. Solve for $x$: $x + 2 = \sqrt{6x} + 28$
   
   a) No Solution
   b) (-4, 6)
   c) (-4)
   d) (6)

11. What are the zeroes of $g(x) = 2x^3 - 8x^2 + 6x$
   
   a) 0, 1, 3
   b) 0, -1, -3
   c) 1, 2, 3
   d) 0, 1, -4
   e) 3, -2, 2
12. Draw two marbles, without replacement, from a bag containing one green, two yellow, and three red marbles. What is the probability of drawing exactly one red marble in the two draws?

   a) 2/5  
   b) 0  
   c) 3/5  
   d) 11/15

13. What is the value of: \( \log_2\left(\frac{1}{\sqrt{32}}\right) \)

   a) \( -\frac{5}{2} \)  
   b) \( -\frac{2}{5} \)  
   c) \( \frac{5}{2} \)  
   d) \( \frac{5}{3} \)  
   e) None of the above
Part I ... Multiple Choice Problems: 

14. Solve for x: \(|2x + 1| + 3 \leq 8\)
   
   a) \([-3, 2]\) 
   b) \([-2, 5]\) 
   c) \((-\infty, -3] \cup [2, \infty)\) 
   d) \((-\infty, -2] \cup [5, \infty)\)

15. What is the y-intercept of: \(4(y - 1) = 2^{[2(x+1)]}\)
   
   a) \(\frac{1}{4}\) 
   b) 0 
   c) 1 
   d) 2 
   e) -1
16. Match \(4x^2 + 9y^2 = 36\) with the correct graph below.
Part I ... Multiple Choice Problems: Name(Print):__________

17. Solve for x: \(4^x (2^{x+3}) = 16^{(2x-5)}\)

a) \(\frac{23}{5}\)
b) \(-\frac{15}{2}\)
c) \(\frac{15}{2}\)
d) \(\frac{23}{2}\)
e) 1, 5

18. In how many distinguishable ways can the letters in the word BANANA be written?

a) 720
b) 1296
c) 6
d) 60
19. Which of the following equations best represents the line which passes through (1,-1) and through the center of the circle \((x - 2)^2 + (y - 4)^2 = 20\)?

(a) \(y = 5x - 6\)
(b) \(y = 5x + 6\)
(c) \(y = x + 2\)
(d) \(y = x - 2\)

20. For a fee of $2.00, you can play a game in which two fair coins are tossed. If the result of the two coin toss is two heads, you win $5; if one coin is a head and the other is a tail, you win $1. If both coins show a tail, you win nothing! what is the expected value of this game?

a) -$0.25
b) $0.25
c) $1.00
d) $1.25
21. (15 pts) Solve this inequality for $x$, leaving the result in interval notation.

$$x^3 + 4x^2 < 32x$$
22. (15 pts) A survey on payment methods and preferences for 500 customers at a local coffee shop showed the following results:

<table>
<thead>
<tr>
<th>Paid with</th>
<th><strong>Bill size</strong></th>
<th>&lt; $20</th>
<th>≥ $20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td></td>
<td>135</td>
<td>45</td>
</tr>
<tr>
<td>Credit Card</td>
<td></td>
<td>120</td>
<td>200</td>
</tr>
</tbody>
</table>

a) Find the probability that a customer paid with a credit card given that the bill was more than $20.
b) Find the probability that a customer paid with cash or had a bill less than $20.
c) Find the probability that a customer pays with a credit card and the bill is less than $20.
23. (10 pts) Suppose that you have 600\text{m} of fencing with which to build two adjacent rectangular corrals. The two corrals are to share a common fence on one side. Find the dimensions of $x$ and $y$ so that the total enclosed area is as large as possible.
24. (15 pts) A fish population grows according to this equation: $P(t) = 160(e^{0.4t})$ where $t$ is measured in months.

a) What will the fish population be in 10 months?

b) In how many months will the initial population triple?
Part II ... Hand Graded Problems: Name(Print): 

25. (15 pts) Solve the following equation for x: \(4 \ln \sqrt{x} + 2 = 2\)
26. (15 pts) The experiment is to draw a card from a standard deck, four times, replacing the card, and reshuffling after each draw.
   a) What is the size of the sample space of this experiment?
   b) What is the probability of drawing exactly 2 aces?
   c) What is the probability of drawing at least 2 aces?
   d) What is the probability of drawing at most 2 aces?
27. (15 pts) Consider the function:

\[ y = f(x) = -2x^2 - 8x + 10 \]

a) (4 pts) Write this equation in standard form. \( y = a(x - h)^2 + k \)

b) (1 pt) Determine the value of the y-Intercept.

c) (2 pts) Determine the value of the x-Intercepts.

d) (2 pts) Draw a sketch the solution curve, show the coordinates of the vertex, and the x,y intercepts.

e) (1 pt) What is the Domain of this function?

f) (1 pt) What is the Range of this function?

g) (1 pt) Over what values of x is the function Increasing?

h) (1 pt) Over what values of x is the function Decreasing?

i) (1 pt) Over what values of x is the function \( f(x) < 0 \)?

j) (1 pt) Over what values of x is the function \( f(x) > 0 \)?