Math 1031
Sample Midterm 1

This is the format and directions that you will see on the cover page of the actual exam.

Name:

Discussion Section:

Discussion Instructor:

You may use a scientific calculator, but you may not use books, notes, graphing calculators, or your neighbors’ papers. Sign your name below to certify that you followed these instructions.

Signature:

Do all your work in the space provided on these sheets. If you need additional paper, attach it to these sheets.

On the multiple choice questions, clearly indicate the answer that you choose. If your selection is not clear, you will not earn any points for that problem.

Partial credit will be rewarded on the short answer problems. You will not earn credit for illogical, incorrect, or unsupported work, even if you miraculously arrive at the correct answer. If you are not certain how to do a problem, give it your best attempt so that you may earn some credit for moving in the right direction.

Circle your final answer on the short answer problems.

The exam will be graded out of 100 points. The point value for each problem is listed beside the problem number. There are 6 pages and 12 problems on the exam.

Good luck!
1. (6 points) Factor completely.

\[ x^3 - x^2y - 9x + 9y \]

(a) \((x + 3)(x - 3)(x + y)\)
(b) \((x^2 + 9)(x - y)\)
(c) \((x + 9y)(x^2 - xy + 9)\)
(d) \((x + 3)(x - 3)(x - y)\)

2. (6 points) Find the exact solution to the numerical expression.

\[ (4^{-2} + 3^{-1})^{-1} \]

(a) \(\frac{19}{38}\)
(b) \(25\)
(c) \(\frac{1}{25}\)
(d) \(\frac{48}{19}\)

3. (6 points) Solve the inequality. Express the solution in interval notation.

\[ \frac{x}{3} < \frac{20 + x}{15} \]

(a) \(( -\infty, 5 )\)
(b) \( (5, \infty)\)
(c) \(( -\infty, -2)\)
(d) \(( -2, \infty)\)
4. (6 points) Solve the equation.

\[\sqrt[3]{7}x + 1 = -4\]

(a) \(x = \left\{ \frac{65}{7}, -\frac{65}{7} \right\}\)
(b) \(x = \frac{65}{7}\)
(c) \(x = -\frac{65}{7}\)
(d) no real solutions

5. (6 points) Solve for \(a\).

\[2(a + 3) = -3(2a - 5)\]

(a) \(a = -\frac{21}{8}\)
(b) \(a = \frac{9}{8}\)
(c) \(a = -1\)
(d) \(a = -\frac{9}{4}\)

6. (6 points) Subtract and simplify if possible.

\[\frac{2}{n^2 - 9} - \frac{5}{n - 3}\]

(a) \(-\frac{13 - 5n}{(n-3)(n+3)}\)
(b) \(-\frac{3}{(n-3)(n+3)}\)
(c) \(-\frac{3}{n^2 - n - 12}\)
(d) \(\frac{17 - 5n}{(n-3)(n+3)}\)
7. (10 points) A total of $4,000 is invested, part at 4% interest per year, and the rest at 5% interest per year. If the total yearly interest is $187.50, how much is invested at each rate?
8. (10 points) Find the real solutions for $t$ in the following equation.

$$t^{-4} - 2t^{-2} - 15 = 0$$

9. (12 points) A car radiator has 5 quarts of 10% antifreeze. How much should be drained and replaced with 100% antifreeze to get 5 quarts of 40% antifreeze?
10. (10 points) Solve the inequality and express the solution set in interval notation.

\[ \frac{4x - 1}{x - 1} \leq 6 \]

11. (10 points) A rectangle is 5 times as long as it is wide. Its area is 125 square feet.

(a) Write an equation to describe this situation.

(b) Solve the equation.

(c) What are the dimensions of the rectangle?
12. (12 points) Find the values of $x$ that satisfy the inequality. Express the solution in interval notation.

$$3 \left| \frac{3x - 1}{2} \right| > 5$$