Math 1031
Midterm 1

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 8 pages and 12 problems on the exam.

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

\[2x^4 - 13x^3 - 7x^2\]

(a) \((2x^2 + 1)(x^2 - 7)\)
(b) \((2x^2 - 1)(x^2 + 7)\)
(c) \(x^2(2x - 1)(x + 7)\)
(d) \(x^2(2x + 1)(x - 7)\)

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

\[2^{-3} - 3^{-2}\]

(a) 1
(b) \(\frac{1}{72}\)
(c) -1
(d) 0.0139
3. (6 points) Solve this inequality. Express the answer in interval notation.

\[
\frac{x}{3} - \frac{x - 1}{7} \geq \frac{x + 2}{21} - 4
\]

(a) \([-5/3, \infty)\]
(b) \((-\infty, -5/3]\)
(c) \([-85/3, \infty)\]
(d) \((-\infty, -85/3]\)

4. (6 points) Solve the equation.

\[
\sqrt{5x + 17} + 6 = 4
\]

(a) \(x = 5\)
(b) \(x = -5\)
(c) \(x = \frac{9}{5}\)
(d) \(x = -\frac{9}{5}\)
5. (6 points) Solve this equation for \( n \).

\[
\begin{align*}
\frac{n}{2} - \frac{1}{5} &= \frac{23}{10} \\
\end{align*}
\]

(a) \( n = 5 \)
(b) \( n = 14 \)
(c) \( n = 24 \)
(d) \( n = \frac{43}{50} \)

6. (6 points) Simplify the rational expression.

\[
\frac{3x^2 - 12x}{x^2 - 16}
\]

(a) \( \frac{3x - 12}{x - 16} \)
(b) \( \frac{3 - 12x}{16} \)
(c) \( \frac{3x}{x + 4} \)
(d) \( \frac{3x}{x - 4} \)
7. (10 points) Muhammed has 8 more nickels than dimes, and he has $1.15 altogether.

(a) Represent the amount of money with an equation in terms of $d$, the number of dimes.

(b) How many nickels and how many dimes does Muhammed have?
8. (10 points) Solve the equation.

\[ x^{2/3} - x^{1/3} = 12 \]

9. (10 points) How many ounces of pure zinc must be added to 20 ounces of brass which is 30% zinc and 70% copper to produce brass that is 40% zinc?
10. (12 points) Solve the inequality and write the solution in interval notation.

\[ 2x^3 + x^2 - 8x - 4 > 0 \]
11. (10 points) Solve the inequality and express the solution in interval notation.

\[ |2x - 3| + 3 \leq 6 \]

12. (12 points) One side of a rectangle is 6 inches longer than the other side. The area of the rectangle is 16 square inches.

(a) Write a quadratic equation which represents this situation.

(b) Solve the equation from (a).

(c) What are the lengths of the sides of the rectangle?