MAT 104: Exam 2 **Name:** _____
Spring — 2024
04/02/2024
85 Minutes

Write your name on the appropriate line on the exam cover sheet. This exam contains 11 pages (including this cover page) and 10 questions. Check that you have every page of the exam. Answer the questions in the spaces provided on the question sheets. Be sure to answer every part of each question and show all your work. If you run out of room for an answer, continue on the back of the page — being sure to indicate the problem number.

Question	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
Total:	100	

1. (10 points) Let $f(x)$ be the function given by $f(x) = x^2 - 3x + 5$.
   (a) Find the average rate of change of $f(x)$ on $[-1, 2]$.
   (b) Find the average rate of change of $f(x)$ on $[2, 5]$.
   (c) Use (a) and (b) to explain why $f(x)$ cannot be linear.

2. (10 points) Showing all your work, compute the following and express your answer in scientific notation:

   (a) $(4.4 \cdot 10^0) \cdot (7.2 \cdot 10^6)$

   (b) $\dfrac{8.1 \cdot 10^8}{1.7 \cdot 10^5}$

   (c) $\dfrac{(5.6 \cdot 10^3) \cdot (9.4 \cdot 10^{-2})}{3.2 \cdot 10^{-4}}$

3. (10 points) Showing all your work and expressing your answer without using negative powers, simplify the following as much as possible:

   (a) $xy(xy^3)^0(x^5y^2)^4$

   (b) $\dfrac{xy^5}{x^{10}y^{-4}}$

4. (10 points) Showing all your work and expressing your answer in the form $x^a y^b$, simplify the following as much as possible:

   (a) $\dfrac{(xy^4)^{1/2}}{x}$

   (b) $x\sqrt[3]{\dfrac{y^6}{x^{-4}}}$

5. (10 points) Showing all your work, complete the following:

   (a) Factor out the GCF for the following: $30x^5y^3 - 12x^2y^2 + 18xy^7$

   (b) Expand the following: $(2x - 3)^2$

6. (10 points) Showing all your work, factor the following as much as possible:

   (a) $x^2 + 15x + 54$

   (b) $6x^2 + 11x - 10$

7. (10 points) Consider the polynomial $f(x) = x^2 - 4x + 1$.

   (a) Use the discriminant of $f(x)$ to explain why $f(x)$ does not factor 'nicely.'

   (b) Expand $(x - 2 - \sqrt{3})(x - 2 + \sqrt{3})$ and simplify to show that $f(x)$ does factor.

8. (10 points) Showing all your work, solve the following:

$$\frac{x}{x-1} = \frac{3x}{x+4}$$

9. (10 points) Showing all your work, factor the following as much as possible:

   (a) $-2x^3 - 4x^2 + 96x$

   (b) $1 - 81x^4$

10. (10 points) Let $f(x) = 90x^2 - 2291x + 13860$. Showing all your work, complete the following:

    (a) Use the quadratic formula to find the roots of $f(x)$.

    (b) Use (a) to factor $f(x)$.