MAT 104: Exam 3 **Name:** _____
Spring – 2023
05/04/2023
85 Minutes

Write your name on the appropriate line on the exam cover sheet. This exam contains 16 pages (including this cover page) and 15 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.

Question	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
11	10	
12	10	
13	10	
14	10	
15	10	
Total:	150	

1. (10 points) Find the average rate of the function $f(x) = \dfrac{x+1}{x-3}$ on the interval $[-1, 4]$.

2. (10 points) Find the average rate of change of the function $f(x) = x^2 + x - 3$ on the interval $[a, a + h]$.

3. (10 points) Factor the polynomial $x^3 + 3x^2 - 28x$ as completely as possible.

4. (10 points) Factor the polynomial $2x^2 - 6x - 36$ as completely as possible.

5. (10 points) Factor the polynomial $(16x^4 - 1)(x + 4) + (16x^4 - 1)(x - 3)$ as completely as possible.

6. (10 points) Use the quadratic formula to factor the polynomial $24x^2 + 77x + 60$.

7. (10 points) Use the discriminant to explain why the polynomial $x^2 - 10x + 7$ does not factor over the integers. Use the quadratic formula to factor the polynomial.

8. (10 points) A polynomial, $p(x)$, of degree two has roots $x = -6$ and $x = 5$. Furthermore, the polynomial $p(x)$ is such that $p(4) = -30$. Find the polynomial $p(x)$.

9. (10 points) List all the possible rational roots for the polynomial $3x^5+8x^4-7x^2+9x-6$.

10. (10 points) Find the quotient and remainder when $x^5 + 3x^4 + 2x^3 + 4x^2 - 30x + 13$ is divided by $x^2 + 3x - 2$.

11. (10 points) Being sure to simplify as much as possible, compute the following:

$$\frac{9-5x}{x^2+7x-8} - \frac{6x}{x-1}$$

12. (10 points) Being sure to simplify as much as possible, compute the following:

$$\frac{x^2+4x-5}{x^2+5x+4} \cdot \frac{x^2+4x+3}{x^2+3x-10}$$

13. (10 points) Being sure to simplify as much as possible, compute the following:

$$\frac{\dfrac{x^2-9}{x^2+6x}}{\dfrac{x^2+x-6}{x^2+4x-12}}$$

14. (10 points) Find the domain of the function $f(x) = \dfrac{x^2 - 3x - 10}{x^2 - 4}$. Furthermore, identify any zeros, vertical asymptotes, horizontal asymptotes, and holes for the function $f(x)$.

15. (10 points) Explain why the function $f(x) = \dfrac{3x^2 + 4x - 8}{x + 3}$ has a slant asymptote. Find the slant asymptote for this function.