

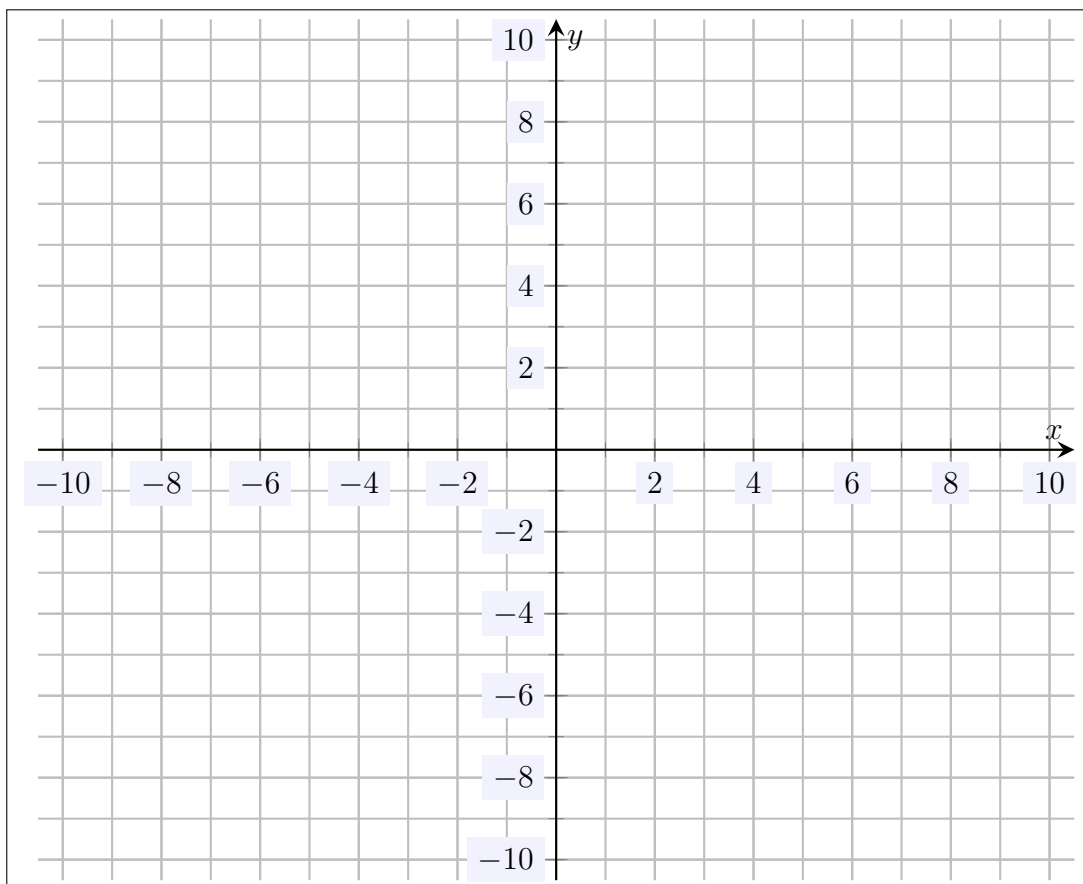
MAT 101: Exam 3
Summer – 2022
06/09/2022
85 Minutes

Name: Caleb McWhorter — Solutions

Write your name on the appropriate line on the exam cover sheet. This exam contains 21 pages (including this cover page) and 20 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	
16	10	
17	10	
18	10	
19	10	
20	10	
Total:	200	

1. (10 points) Plot the quadratic function $y = 6 - 4\left(x + \frac{9}{2}\right)^2$ as accurately as possible. Your sketch should include the vertex and axis of symmetry.



2. (10 points) Consider the quadratic function $f(x) = 4 - 8x - x^2$.
- (a) Determine if the parabola opens upwards or downwards.
 - (b) Is the parabola convex or concave?
 - (c) Does the parabola have a maximum or minimum?
 - (d) Find the vertex and axis of symmetry.
 - (e) Find the maximum/minimum value of $h(x)$.

3. (10 points) Showing all your work, factor the following completely:

(a) $5x^2 - 10x$

(b) $81 - 4x^2$

(c) $x^2 - 8x - 20$

4. (10 points) Showing all your work, factor the following completely:

(a) $2x^2 + 32x - 160$

(b) $10x^2 - 29x - 21$

5. (10 points) Use the quadratic equation to factor the following polynomial:

$$2520x^2 + 12171x - 31680$$

6. (10 points) Showing all your work and simplifying completely, solve the following:

$$x^2 = 3(2x - 3)$$

7. (10 points) Showing all your work and simplifying completely, solve the following:

$$x(x + 4) = 45$$

8. (10 points) Showing all your work and simplifying completely, use the quadratic formula to solve the following:

$$-8x = 10 - 8x^2$$

9. (10 points) Showing all your work and simplifying completely, use the quadratic formula to solve the following:

$$\frac{x^2 - 14x}{3} = 159$$

10. (10 points) Showing all your work and simplifying completely, solve the following:

$$\frac{2x - 1}{x + 5} = x - 5$$

11. (10 points) Consider the following rational function:

$$f(x) = \frac{x^2 - 4x - 5}{x^2 - 7x + 10}$$

Find the domain of $f(x)$. Also, find any vertical asymptotes and holes for $f(x)$.

12. (10 points) Showing all your work and simplifying as much as possible, compute the following:

$$\frac{x-7}{x^2-16} - \frac{x^2}{x^2+10x+24}$$

13. (10 points) Showing all your work and simplifying as much as possible, compute the following:

$$\frac{x}{x-1} - \frac{2x+1}{x+1} + \frac{6}{x}$$

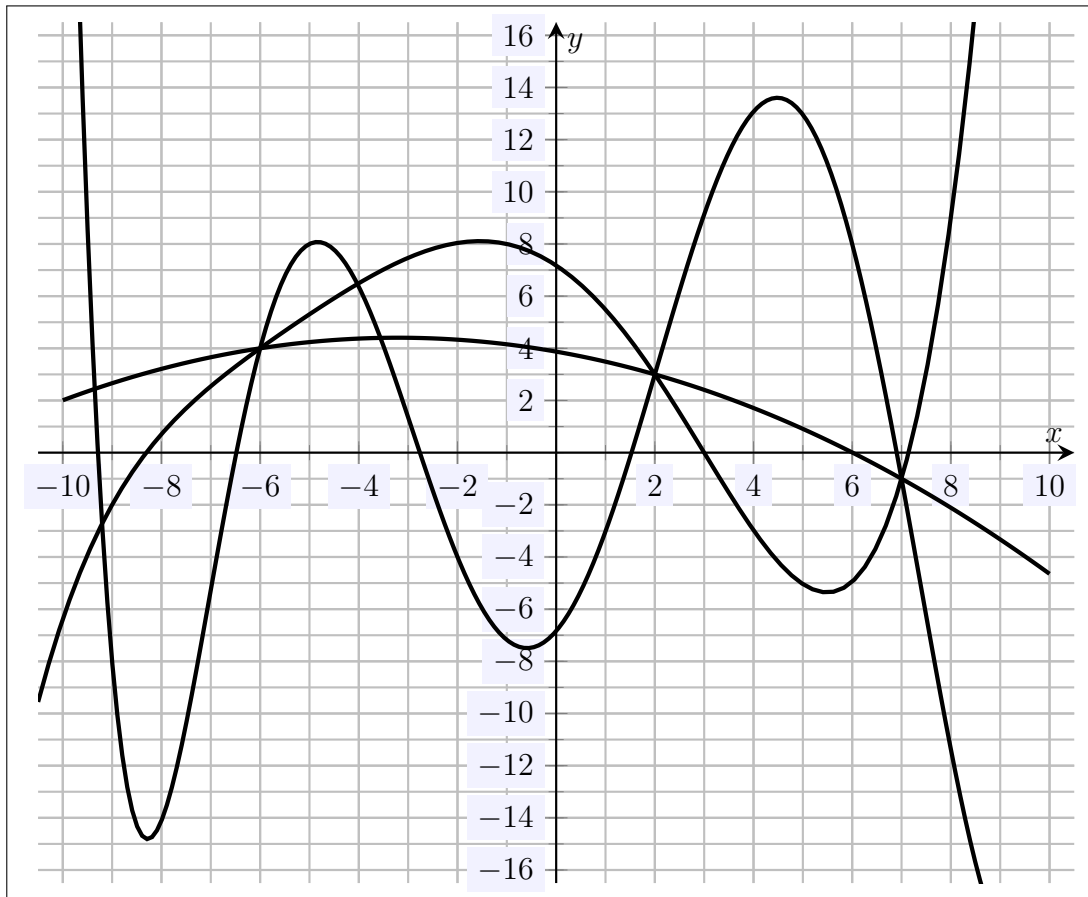
14. (10 points) Showing all your work and simplifying as much as possible, compute the following:

$$\frac{x^3 - x^2}{x^2 + 3x - 40} \cdot \frac{x^2 + x - 30}{4x - x^2}$$

15. (10 points) Showing all your work and simplifying as much as possible, compute the following:

$$\frac{\frac{x^2 + 3x + 2}{24x^2 - 4x}}{\frac{x^2 + 14x + 24}{2x - 2x^2}}$$

16. (10 points) Find all the solutions to the system of equations given by the three curves below:



17. (10 points) Fully justifying your answer, determine if the following system of equations has a solution:

$$\begin{cases} x + 3y = 6 \\ -2x - 6y = 24 \end{cases}$$

18. (10 points) Fully justifying your answer, determine if $(-2, 7)$ is a solution to the following system of equations:

$$8x + 5y = 19$$

$$x + y = 5$$

19. (10 points) Showing all your work, solve the following system of equations:

$$\begin{cases} 2x - 5y = 1 \\ 3x + 4y = -1 \end{cases}$$

20. (10 points) Showing all your work, solve the following system of equations:

$$\frac{1}{2}x - y = 7$$

$$-x + \frac{1}{4}y = -7$$