MAT 1070 Final Exam
Winter 2021

Directions: At the top of your Final Exam paper write the following statement *and sign it.*

"All work is my own. I am not using any outside assistance to complete this exam. I am not using a calculator or the internet to find or check answers. I am not providing assistance to another person taking this exam."

- *Please have your camera on and your microphone muted.* Webcams are required to be on for the duration of the Test.
- *Please ask all questions to me privately in the chat window.*
- Please read the directions to each problem carefully.
- Solutions should be written clearly and concisely on blank sheets of paper. **All work must be shown to receive full credit.** *Answers without <u>correct</u> supporting work will receive minimal credit.*
- **No outside assistance of any kind is allowed.** This includes using the internet to find answers, using your notes, having another person look at your work before submission, looking at another person's work before submission, and/or sharing information in any way while completing the Final Exam.
- Calculators are not permitted. *Points will be deducted for evidence of obvious calculator use and could result in receiving a 0 on the problem involved, and failing the exam.*
- Webcams are required to be on for the duration of the exam.
- You will have 120 minutes to complete the Final Exam and an additional 15 minutes to upload your work on Canvas.

1) Given the function $f(x) = \begin{cases} x^2 + 3 & \text{for} & x < -4 \\ -1 - x & \text{for} & -4 \le x \le 5 \\ -2 & \text{for} & x > 5 \end{cases}$, find the following.

    a. $f(-3)$

    b. $f(5)$

2) Write an equation for a function that has the shape of $y = \sqrt{x}$, but is reflected over the x-axis and shifted left 5 units.

3) Solve: $\log_2(x + 5) - \log_2(x - 3) = \log_2 x$

4) Find: a. $\log_8 \sqrt{8}$ b. $\log 1000$ c. $\log_{27} \frac{1}{3}$ d. $\log_4 \frac{1}{16}$

5) Maria is selling her handmade jewelry on Etsy. In the month of April she sold a total of 68 pieces. Necklaces sold for $30 each, bracelets sold for $20 each and her sales totaled $1540. How many of each did she sell?

6) Write the slope-intercept equation for the line that passes through the point (1, 2) and is parallel to the line $5x - y = 17$.

7) Given the functions $f(x) = 1 - 3x$, $g(x) = -x^2 + 4x - 1$, and $h(x) = \sqrt{6x + 5}$, find and simplify the following.
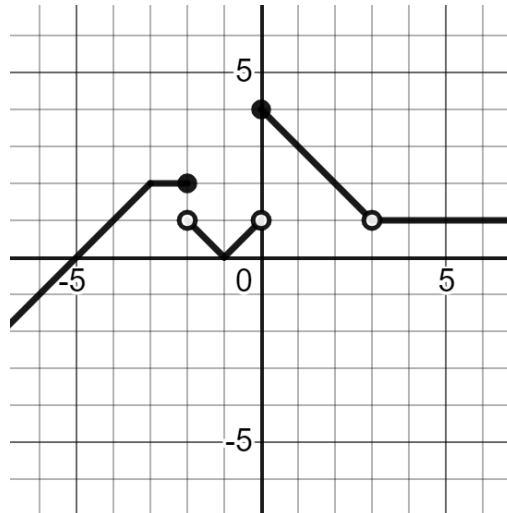
    a. $(gf)(x)$

    b. $(h \circ g)(2)$

    c. $(f \circ g)(x)$

8) Find the domain of the following function:
$$f(x) = \frac{x - 3}{x^2 + 5x}$$

9) For the function shown, find:

    a. Domain
    b. Range
    c. $f(0)$
    d. Intervals of increase
    e. Intervals of decrease

10) Solve: $\dfrac{3y}{y+2} + \dfrac{6}{y} = \dfrac{12}{y^2 + 2y}$

11) A gymnast dismounts the uneven parallel bars. Her height, h, in feet, depends on the time, t, in seconds, that she is in the air as follows: $h(t) = -16t^2 + 8t + 8$
    a. How long will it take the gymnast to reach the ground?
    b. When will the gymnast be 8 feet above the ground?

12) Solve: $\sqrt{x - 3} - \sqrt{x} = 3$

13)   Solve: $12 - |2x + 1| < 9$

14)   Solve: $x^{\frac{2}{3}} - 2x^{\frac{1}{3}} - 8 = 0$

15)   Find and simplify the difference quotient for the following function: $f(x) = x^2 - x$.

16)   Solve, writing any non-real solutions in the form $a + bi$: $3 - x = x^2 - 3x + 7$

17)   For the function $g(x) = x^2 - 4x + 5$
      a. Find the vertex by completing the square.
      b. Graph the function, labeling the vertex and all x- and y-intercepts.

18)   A conic section is given by the equation: $9x^2 + 81y^2 = 81$
      a. Identify the conic section.
      b. Sketch the graph labeling all relevant points.

19)   Solve: $x - 2 > -\dfrac{1}{x}$

20)   The custom rectangular frame for Lia's artwork is twice as long as it is wide. The sides of the frame have a uniform width of 2 cm so that 96 cm² of the picture shows. What are the dimensions of the frame?