MAT 1070 Final Exam
                        ## Fall 2020

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. 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 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 assessment.
- Calculators are not permitted.
- Webcams are required to be on for the duration of the exam.
- You will have 120 minutes to complete the Test and an additional 15 minutes to upload your work on Canvas.

1. Find and simplify the difference quotient for the following function:
$$f(x) = 3x^2 - 10$$

2. For the function shown, find:
   a) Domain
   b) Range
   c) $f(0)$
   d) Intervals of increase
   e) Intervals of decrease
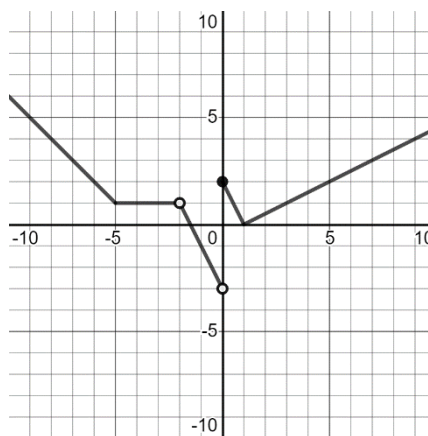
3. Write the slope-intercept equation for a line perpendicular to the line $4y - 12x = 36$, that passes through the point (0,-1).

4. Given the following function:

$$f(x) = \begin{cases} 2x + 7 & for\ x < -2 \\ 1 & for\ -2 \le x < 1 \\ -x + 2 & for\ x \ge 1 \end{cases}$$

Find: a) $f(-2)$

   b) $f(2)$

5. Determine the domain of the function: $f(x) = \dfrac{x+1}{x^2 - 6x + 5}$

6. The Roasted Bean charges $11 per pound of Fair Trade Organic Mexican coffee and $6 per pound of Fair Trade Organic Peruvian coffee. How much of each type should be used to make a 20-lb. blend that sells for $7 per pound?

7. Solve: $3|x + 8| - 4 \ge 26$

8. Solve: $\dfrac{x}{x-2} + \dfrac{20}{x^2 - 4} = \dfrac{7}{x-2}$

9. Solve: $\sqrt{x - 4} - \sqrt{x} = -2$

10. A rectangular piece of cardboard is 4 inches longer than it is wide. A 3-inch square is cut from each corner, and the four flaps are folded up to form an open box with a volume of 351in³. Find the length and the width of the original piece of cardboard.

11. Graph, labeling the vertex and all x- and y-intercepts: $f(x) = -x^2 + 6x - 5$

12. Solve: $x^2(x + 5) > 0$

13. Solve, writing any non-real solutions in the form $a + bi$: $(x + 3)(x - 1) = -5$

14. Solve: $3y^{\frac{1}{4}} - 2 = -2y^{\frac{1}{2}}.$

15. Given the approximate values $\log_2(5) = 2.3$ and $\log_2(15) = 3.9$ find:

   a) $\log_2(10)$ b) $\log_2(125)$ c) $\log_2(3)$

16. Solve: $\log_5(x + 4) + \log_5(x - 4) = \log_5(20)$

17. A conic section is given by the equation $4y^2 = 100 - 25x^2$.

    a.) Identify the conic section.
    b.) Sketch the graph of the conic section. Plot and label all relevant points.

18. A patient is receiving a certain medication in the hospital. The amount of drug (in milligrams) in their bloodstream t days after the drug is taken can be modeled by the function $P(t) = -2t^3 + 4t^2 - 16t + 32$. Find the number of days it will take for the drug to be completely eliminated from the patient's bloodstream.

19. Given the functions $f(x) = x^2 - 1$, $g(x) = \sqrt{2x + 3}$, and
    $h(x) = -2x^2 - 3x + 1$, find:
    a.) $(f - h)(x)$
    b.) $(h \circ h)(-1)$
    c.) $(h \circ g)(x)$

20. Describe how the graph of $y = |x - 1| + 3$ can be obtained from the graph of $y = |x|$ using transformations. Then graph $y = |x - 1| + 3$.