MATH 1070 FINAL EXAM – FALL 2021

SHOW ALL WORK. DO NOT USE A CALCULATOR.

Each problem is worth 10 points.

1) Find the domain of the following function:
$$f(x) = \sqrt{3x - 2}$$

2) Given the function $g(x) = \begin{cases} 2 & \text{for} & x < -2 \\ 3 - x^2 & \text{for} & -2 \le x \le 4 \\ \sqrt{x} & \text{for} & x > 4 \end{cases}$, find the following:

   a. $g(-2)$

   b. $g(9)$

3) Write an equation for a function that has the shape of $y = x^2$, but is reflected over the x-axis and shifted right 4 units.

4) Find and simplify the difference quotient for the following function: $f(x) = 4 - x^2$.

5) Solve: $\log_5(1 - x) = 1 - \log_5(5 - 2x)$

6) Given the approximate values $\log_5 3 = 0.7$, and $\log_5 21 = 1.9$, find

   a) $\log_5 7$ b) $\log_5 15$ c) $\log_5 27$
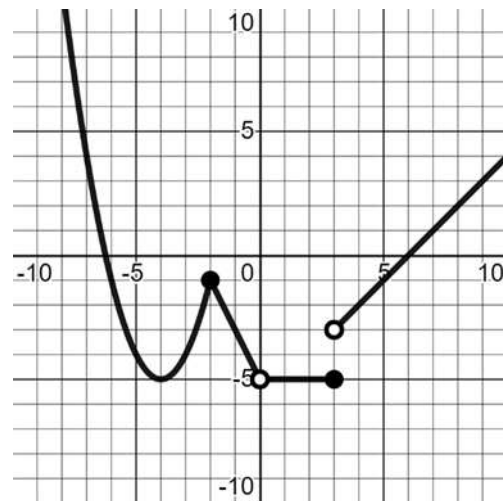
7) For the function shown, find:

   a) The domain

   b) The range

   c) $f(3)$

   d) Intervals of Increase

   e) Intervals of Decrease

8) Solve: $\dfrac{x+4}{x+5} - \dfrac{x+1}{x} = \dfrac{3x+5}{x^2+5x}$

9) Solve: $\sqrt{2x+1} + \sqrt{x} = 1$

10) The height h, in feet, of an object thrown vertically upward from the ground is given by $h = 2t^2 - 3t - 2$, where t is in seconds. How long will it take the object to return to the ground?

11) Fernando's two student loans total $10,000. One loan is at 4% simple interest, and the other is at 6% simple interest. At the end of 1 year, Fernando owes $472 in interest. What is the amount of each loan?

12) Write the slope-intercept equation for the line that passes through the point (1, -2) and is perpendicular to the line $2x + 4y = -9$.

13) Given the functions $f(x) = -\frac{1}{2}x$, $g(x) = -x^2 - 2x + 5$, and $h(x) = \sqrt{10 - x}$, find and simplify the following:

   a. $(gf)(x)$

   b. $(h \circ g)(-1)$

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

14) Solve: $2|4x - 1| + 3 \le 9$.

15) Solve: $2x^{\frac{1}{3}} - 5x^{\frac{1}{6}} + 2 = 0$.

16) Solve, writing any non-real solutions in the form $a + bi$: $x^2 - x - 2 = 3x - 8$.

17) For the function
$$g(x) = 2x - x^2$$

   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:
$$x^2 - 4y^2 - 16 = 0$$

   a. Identify the conic section.
   b. Sketch the graph labeling all relevant points.

19) Solve:
$$\frac{(2 - x)(x + 1)}{x^2} \ge 0$$

20) A rectangular flower bed is to be 3 m longer than it is wide. The flower bed will have an area of 88 m^2. What will its dimensions be?