

**QUIZ 1B**

(CHAPTER 1: FUNCTIONS)

MATH 141 – SPRING 2023 – KUNIYUKI

60 POINTS TOTAL

**No notes or books allowed. A scientific calculator is allowed.**

You may assume that two-dimensional graphs are in the usual Cartesian  $xy$ -plane. Give exact answers, unless you are told to approximate.

**SHORTER PROBLEMS (21 POINTS)**

1) (5 points). Write the domain of  $f$ , where  $f(x) = \frac{\sqrt[4]{x+2}}{x-3}$ , using interval form (the form with parentheses and/or brackets).

2) (1 point). Evaluate  $\lceil\lceil -2.3 \rceil\rceil$ . (This is the same as  $\lfloor\lfloor -2.3 \rfloor\rfloor$ .)

3) (2 points). Find functions  $g$  and  $f$  such that  $(f \circ g)(x) = (3x - 5)^4$ .

You may not use the identity function. Fill in the blanks:

$$g(x) = \underline{\hspace{2cm}} \qquad f(u) = \underline{\hspace{2cm}}$$

4) (1 point). The graph of  $y = \frac{1}{x^4} - x^6$  is symmetric about ... (Box in one:)

the  $x$ -axisthe  $y$ -axis

the origin

(none of these)

5) (1 point). The graph of  $y = x^7 + 1$  is symmetric about ... (Box in one:)

the  $x$ -axisthe  $y$ -axis

the origin

(none of these)

6) (2 points). If the point  $(-1, 4)$  lies on the graph of  $y = f(x)$ , where  $f$  is a one-to-one function, what point must then lie on the graph of  $y = f^{-1}(x)$ ?

- 7) (6 points). Match the equations with their corresponding graphs by writing the appropriate letters in the blanks. The  $x$ - and  $y$ -axes are not necessarily scaled the same way.

The graph of  $y = \frac{1}{x}$  is Graph \_\_\_\_.

The graph of  $y = \frac{1}{x^2}$  is Graph \_\_\_\_.

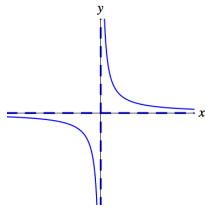
The graph of  $y = \sqrt[3]{x}$  is Graph \_\_\_\_.

The graph of  $y = x^{2/3}$  is Graph \_\_\_\_.

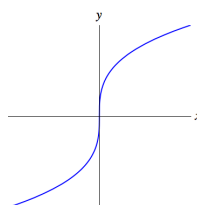
The graph of  $y = \sqrt{16 - x^2}$  is Graph \_\_\_\_.

The graph of  $y = |x|$  is Graph \_\_\_\_.

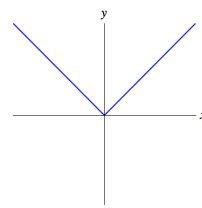
Graph A



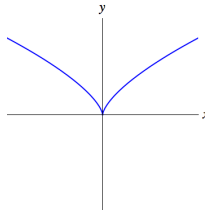
Graph B



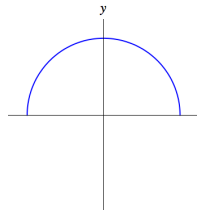
Graph C



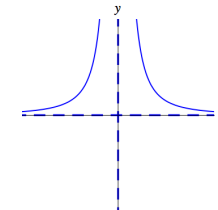
Graph D



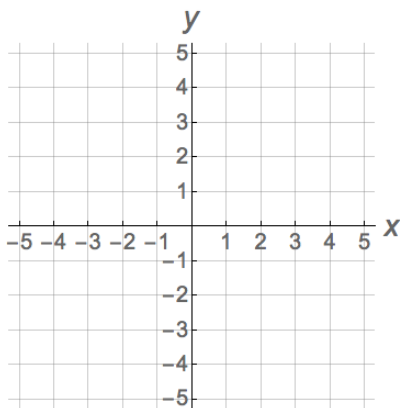
Graph E



Graph F



- 8) (2 points). Graph  $x = y^2 + 1$  on the grid below.



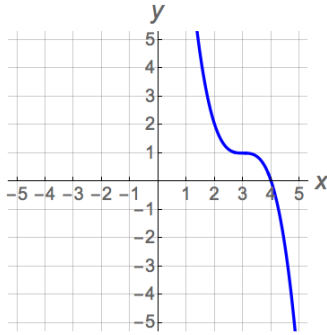
- 9) (1 point). Let  $f(x) = \frac{x-2}{3}$ . What is  $f^{-1}(x)$ ?

**LONGER PROBLEMS (39 POINTS)**

Show all work, simplify as appropriate, and use “good form and procedure” (as in class).  
Box in your final answers!

- 10) Find **and box in** the  $x$ -intercept[s] (if any) of the graph of  $y = \sqrt{\frac{3x^2 - 8x + 2}{x - 5}}$  in the usual  $xy$ -plane. Hint: Factoring over  $\mathbb{Z}$ , the set of integers, won't work here. (7 points)

- 11) The graph below is obtained by taking a basic graph from Section 1.3 and applying rigid transformations. Find an equation for the graph. (5 points)



Fill in the blank:  $y =$  \_\_\_\_\_.

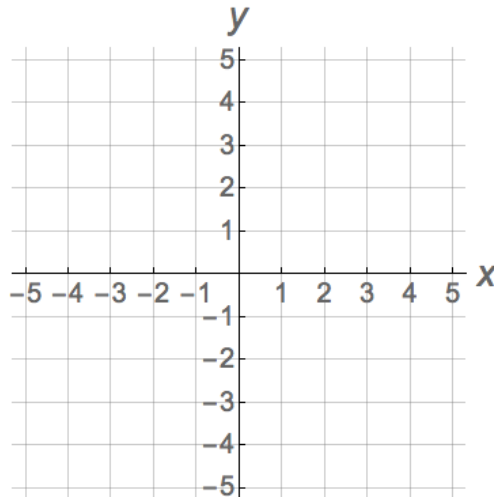
- 12)  $f$  is the function defined piecewise by:  $f(x) = \begin{cases} x^2 + 1, & -2 \leq x \leq 1 \\ \sqrt{x-1}, & 1 < x < 5 \end{cases}$ . (11 pts.)

a) Evaluate  $f(-2)$ . (1 point)

b) Evaluate  $f(2)$ . (1 point)

c) Evaluate  $f(6)$ . (1 point)

d) Graph  $y = f(x)$  on the grid below. Be accurate. Clearly indicate whether endpoints are included or excluded, as in class. (6 points)



- e) Give the **domain** of the function  $f$  using interval form (the form with parentheses and/or brackets). (1 point)
- f) Give the **range** of the function  $f$  using interval form (the form with parentheses and/or brackets). (1 point)

- 13) Let  $f(x) = 4x^3 - x$ . Find the average rate of change of  $f$  from  $x = 2$  to  $x = 6$ . Assume that  $x$  is length measured in inches and  $f(x)$  is cost measured in dollars. Write the appropriate unit in your final answer. (7 points)

- 14) Let  $f(x) = \frac{3}{x}$ . Simplify the difference quotient completely: (9 points)

$$\frac{f(x+h) - f(x)}{h}$$