

**MATH 30 - Precalculus, Sec. 2495**

**First test. Time allowed: two hours.** Professor Luis Fernández

**NAME:** \_\_\_\_\_

[20] **1.** Answer the following questions.

**a)** Suppose that the functions  $f$  and  $g$  are inverses of each other. If  $f(4) = -7$ , how much is  $g(-7)$ , and why?

**b)** Let  $f$  be the function defined by:  $f(x) = \begin{cases} 3x & \text{if } x \leq 2 \\ x - 5 & \text{if } x > 2 \end{cases}$ . Find  $f(0)$ ,  $f(2)$ , and  $f(5)$ .

**c)** Is the function  $f(x) = x^2 - 1$  injective, and why?

**d)** Is the function  $f(x) = \frac{7x^2 + 3}{5x^2}$  even, odd or neither, and why?

[15] **2.** For  $f(x) = 3x^2$ , find and simplify:  $\frac{f(x+h) - f(x)}{h}$ .

[16] **3.** Find the domain of the function  $f(x) = \frac{x}{x-1} + \sqrt{x+3}$ .

[9] 4. Use the graph of the function  $f$  given below to find

a)  $f(3) =$

b)  $f(-3) =$

c)  $(f \circ f)(5) =$

d) The domain of  $f$ .

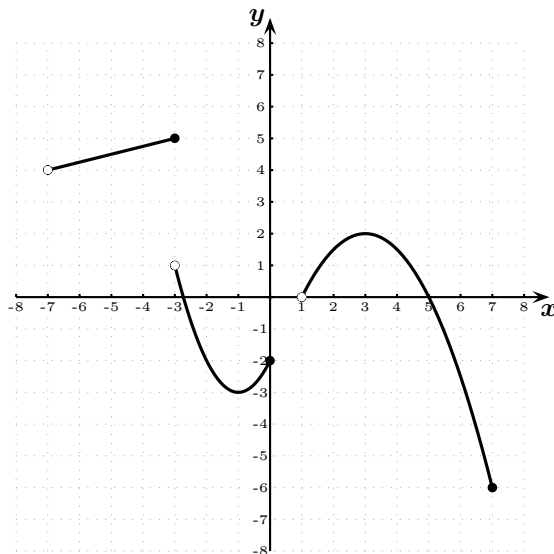
e) The range of  $f$ .

f) The interval(s) where  $f$  is increasing.

g) The interval(s) where  $f$  is decreasing.

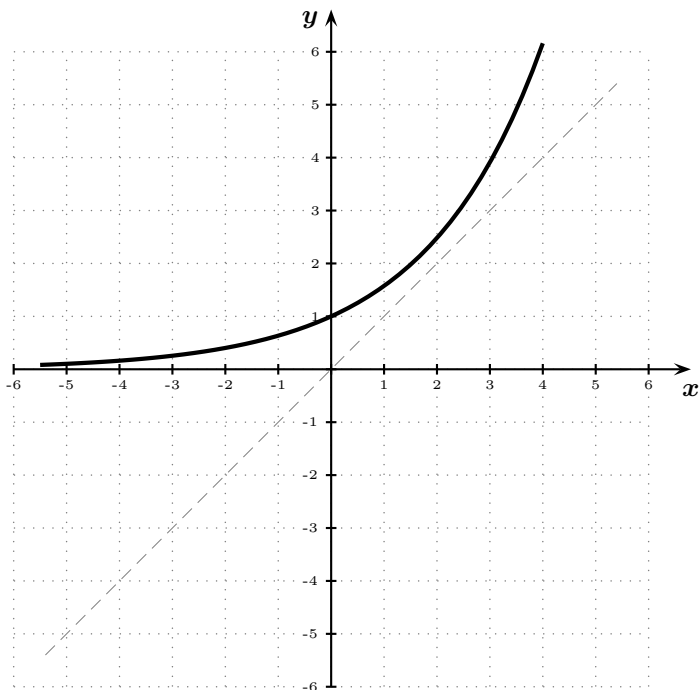
h) The relative maxima of  $f$ .

i) The relative minima of  $f$ .



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[10] 5. The graph of the function  $h$  is given below. Sketch the graph of  $h^{-1}$  in the same coordinate axes.



[16] **6.** Consider the functions  $f(x) = 1 - \frac{1}{x}$  and  $g(x) = \frac{-1}{x-1}$ .

a) Find  $(f \circ g)(x)$  and  $(g \circ f)(x)$  and simplify in order to verify that  $g$  is the inverse of  $f$ .

b) Find the domain of  $f$ .

c) Find the domain of  $g$ .

**Recall** that the range of a function is equal to the domain of its inverse. With this in mind,

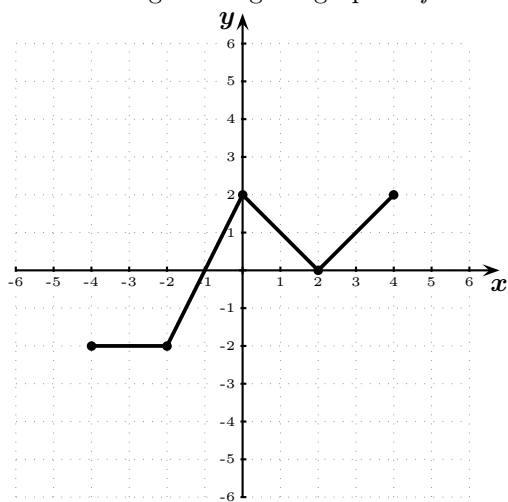
d) Find the range of  $f$ .

e) Find the range of  $g$ .

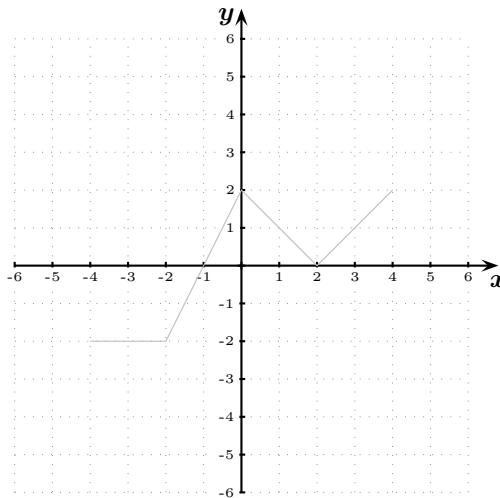
[15] **7.** If  $f(x) = \frac{x}{x+1}$ , find  $f^{-1}(x)$ .

- [15] 8. The following is the graph of the function  $f$ . In the coordinate axes given below, sketch the graph of the indicated functions. (As a reference, the graph of  $f$  is given in each coordinate axes in light gray.)

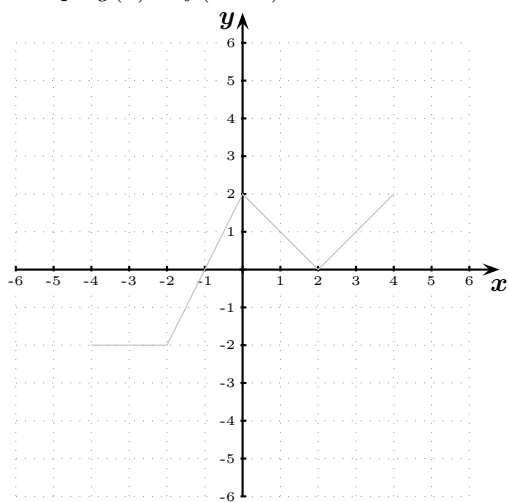
This is the given original graph of  $f$ .



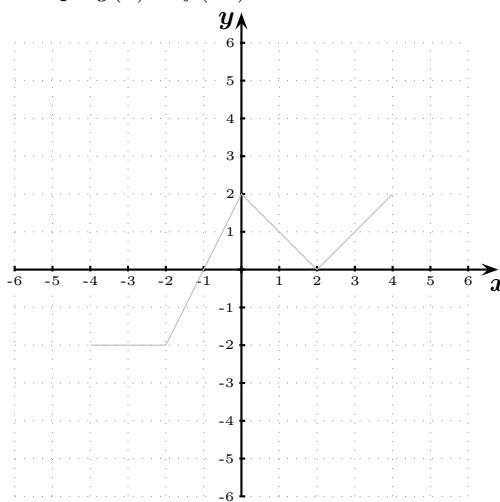
- a) Graph  $g(x) = f(x) + 1$ .



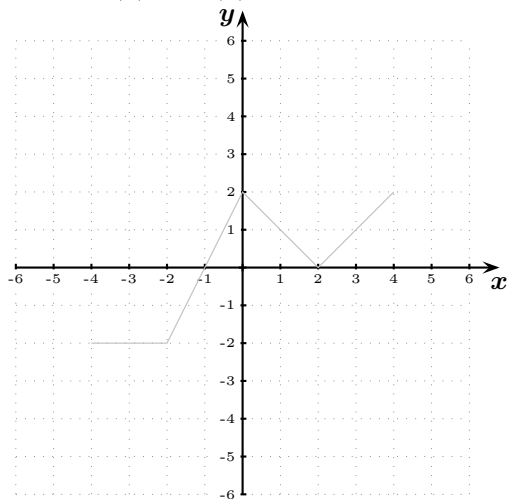
- b) Graph  $g(x) = f(x - 2)$ .



- c) Graph  $g(x) = f(2x)$ .



- d) Graph  $g(x) = 2f(x)$ .



- e) Graph  $g(x) = -2f(x + 2)$ .

