

There are 30 problems on this exam. Carefully read and follow all directions. In order to receive credit show all necessary work. No credit will be given for an answer I cannot find or cannot read. All problems are worth 3 points unless indicated otherwise.

Use the following three functions to determine the specified information in problems 1-14.

$$f(x) = -(x-2)^2 \quad g(x) = \sqrt{x+4} + 2 \quad h(x) = \begin{cases} 3-2x & \text{if } x < 0 \\ x^2 - 4 & \text{if } x \geq 0 \end{cases}$$

1. Domain of  $f$

2. Domain of  $g$

3. Range of  $g$

4.  $(f + h)(0)$

5.  $\left(\frac{f}{h}\right)(0)$

6.  $(f \circ g)(0)$

7.  $(g \circ f)(0)$

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

9.  $(h \circ h \circ h)(1)$

10.  $g^{-1}(10)$

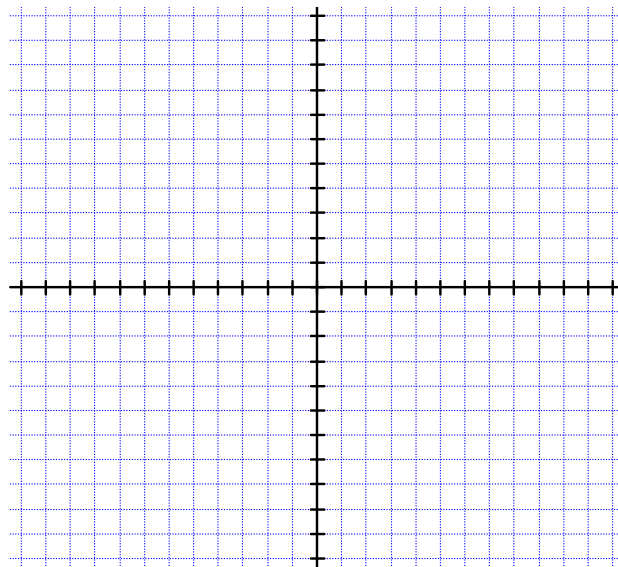
$$f(x) = -(x-2)^2 \quad g(x) = \sqrt{x+4} + 2 \quad h(x) = \begin{cases} 3-2x & \text{if } x < 0 \\ x^2 - 4 & \text{if } x \geq 0 \end{cases}$$

In problems 11-12, use shifts and/or reflections to complete the given statement. (5 pts each)

11. The graph of  $y = f(x)$  is the graph of  $y = x^2$  .....

12. The graph of  $y = g(x)$  is the graph of  $y = \sqrt{x}$  .....

13. Sketch the graph of  $y = h(x)$  on the grid below. (5 points)



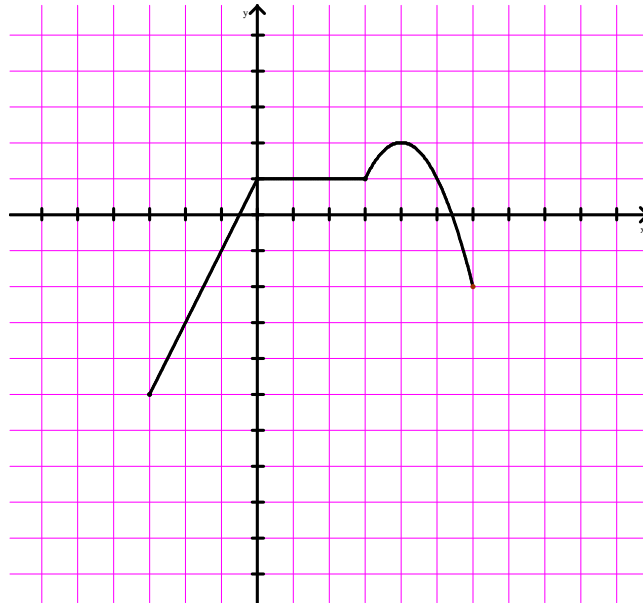
14. Determine the range of  $h$ .

15. When we look at a graph, what test do we use to determine whether or not the graph is a function?
16. When we look at a graph of a function, what test do we use to determine whether or not the function has an inverse function?

Use the function  $F(x) = \frac{x+12}{x-4}$  in problems 17-21.

17. Determine  $F^{-1}(x)$ . (5 points)
18. What is the domain of the function  $F$ ?
19. What is the range of the function  $F$ ?
20. What is the y-intercept on the graph of  $y = F(x)$ ?
21. What is/are the x-intercept(s) on the graph of  $y = F(x)$ ?

Use the graph of the function  $G(x)$  shown below to determine the specified information in problems 22-30.



22. Domain of  $G$

23. Range of  $G$

24.  $G(-2)$

25. For what values of  $x$  is the function  $G(x)$  increasing?

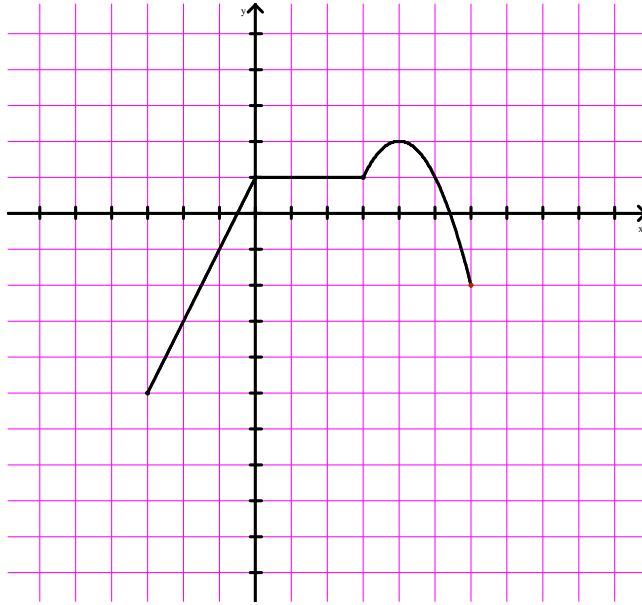
26. For what values of  $x$  is the function  $G(x)$  decreasing?

27. For what values of  $x$  is the function  $G(x)$  constant?

28. Circle the letter of the response that best completes the following statement.

The point  $(4, 2)$  on the graph of  $y = G(x)$  is

- (A) a local maximum but not an absolute maximum.
- (B) a local maximum and an absolute maximum.
- (C) a local minimum but not an absolute minimum.
- (D) a local minimum and an absolute minimum.
- (E) not an extreme point for  $G(x)$ .



29. Graph  $y = G(-x)$ . (4 pts)

30. Graph  $y = G(x + 3) - 2$ . (4 pts)

