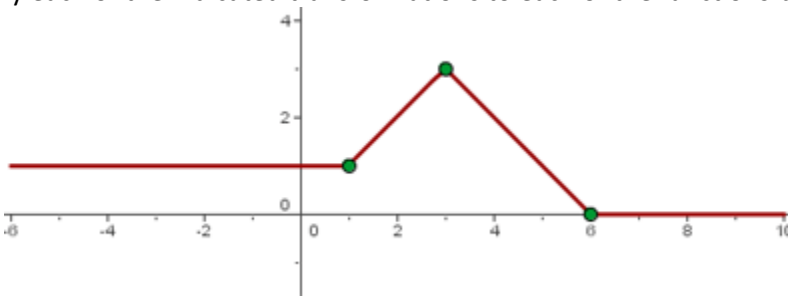
MTH 161, Homework #2, Fall 2024 Name _____

Instructions: Show work on a separate sheet of paper and attach to this page. You may check your work with technology not available in class, but you should be able to solve problems and show work without such technology.

1. Apply each of the indicated transformations to each of the functions below.



   a.
   b. $f(x) = \sqrt{x}$
   c. $f(x) = x^2(x-1)$
      i. $f(x+1)$
      ii. $f(2x)$
      iii. $f(-x)$
      iv. $-f(x)$
      v. $3f(x)+1$
      vi. $-\frac{1}{2}f(x-3)-2$

2. Determine which transformations have been applied to the graph.
   a. $f(x) = (x-2)^2$
   b. $f(x) = \sqrt{-x+3}$
   c. $f(x) = -|x+4|+1$
   d. $f(x) = \frac{1}{2}(x+1)^3 - 4$

3. For the functions $f(x) = 5 - x^2, g(x) = 6 - \frac{1}{x}, h(x) = \sqrt{2-x}$, find the following and state the domain of each.
   a. $f+g$
   b. $g-h$
   c. fh
   d. $\frac{g}{f}$
   e. $h \circ g$
   f. $h \circ h$
   g. $f \circ h$
   h. $f \circ g \circ h$

4. For each of the functions below, write them as a composition of $f(x)$ and $g(x)$.
   a. $h(x) = (x^2+2x-1)^4$
   b. $h(x) = \sqrt[3]{7x+4}$
   c. $h(x) = \frac{|2x+3|}{2x-3}$

5. Find the inverse functions f^{-1} for each of the following. Graph both functions on the same graph and show that they have symmetry across the line $y = x$.
   a. $f(x) = 2x + 3$
   b. $f(x) = x^3 - 1$
   c. $f(x) = \frac{2x+1}{x-3}$
6. The function $f(x) = x^2 - 1$ fails the horizontal line test. Restrict the function at the line of symmetry and find the inverse of the restricted function.

7. Find the distance between the points, and the midpoint of the line segment between the points $\left(-\frac{1}{4}, \frac{1}{7}\right), \left(\frac{3}{4}, \frac{6}{7}\right)$.

8. Find the standard form of the circles below and state the center and radius of the circle.
   a. $x^2 + y^2 + 6x + 2y + 6 = 0$
   b. $x^2 + y^2 + 12x - 6y - 4 = 0$
   c. $x^2 + y^2 + 3x + 5y + \frac{9}{4} = 0$

9. An open box is made from a square piece of cardboard 24 inches on a side by cutting identical squares from the corners and turning up the sides. Express the volume V as a function of the length of the sides of square cut from the corners. Find and interpret $V(2), V(6)$. Find the domain of V.

10. Let $P(x, y)$ be a point on the graph of $y = x^2 - 4$. Express the distance d from the origin as a function of the point's x-coordinate. Use a graphing utility to find the maximum and minimum distance from the origin for any point above the x-axis.

11. A pool measuring 20 meters by 10 meters is surrounded by a path of uniform width. Express the area of the path, A, in square meters, as a function of its width.