

Please clear your desk of any unnecessary materials. This is a closed book, closed notes, closed neighbor exam. Please write your answers where I can easily find them. Any scratch work you wish to have graded must be legible and organized and written on this test – not on separate scratch paper. Each numbered problem is worth 10 points. You may leave when you have finished.

1. Let $f(x) = x^2 + 3$ and $g(x) = x^2 - 4x$ and $h(x) = \sqrt{x + 2}$. Find each of the following.

1a) $(f - g)(x)$

1b) The domain of $(f - g)(x)$

1c) $\left(\frac{h}{g}\right)(x)$

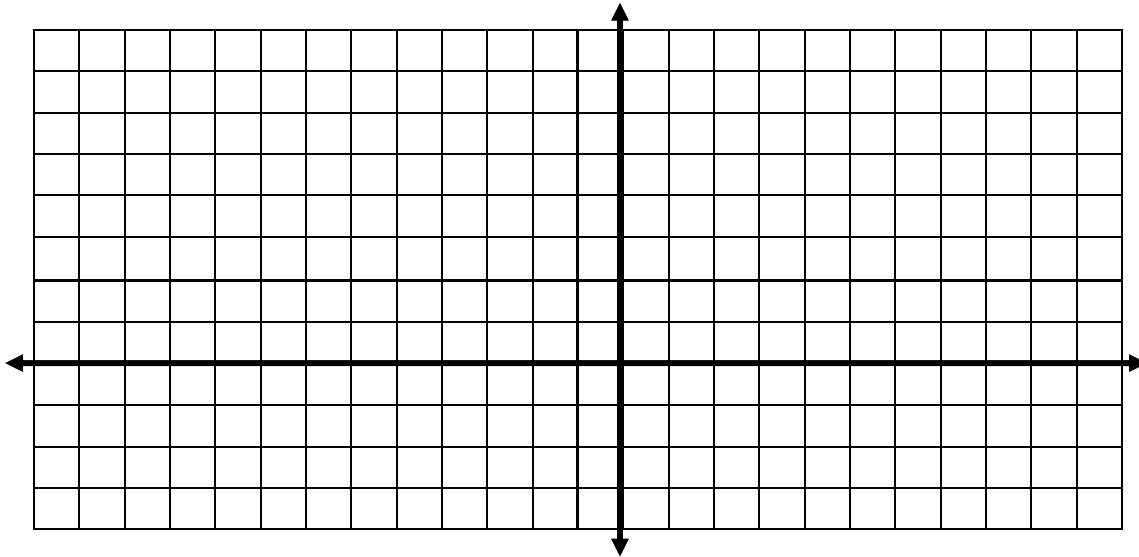
1d) The domain of $\left(\frac{h}{g}\right)(x)$

2. Let $f(x) = 3x^2$. Evaluate $\frac{f(x+h) - f(x)}{h}$.

3. Let $g(x) = -\sqrt[3]{x+3} + 2$

3a) Sketch a graph of $g(x)$ on the axes below. Please use a 1-1 scale.

3b) Label three anchor points (on the graph itself).



4. 4a) Find the domain of $g(x)$.

Domain is _____

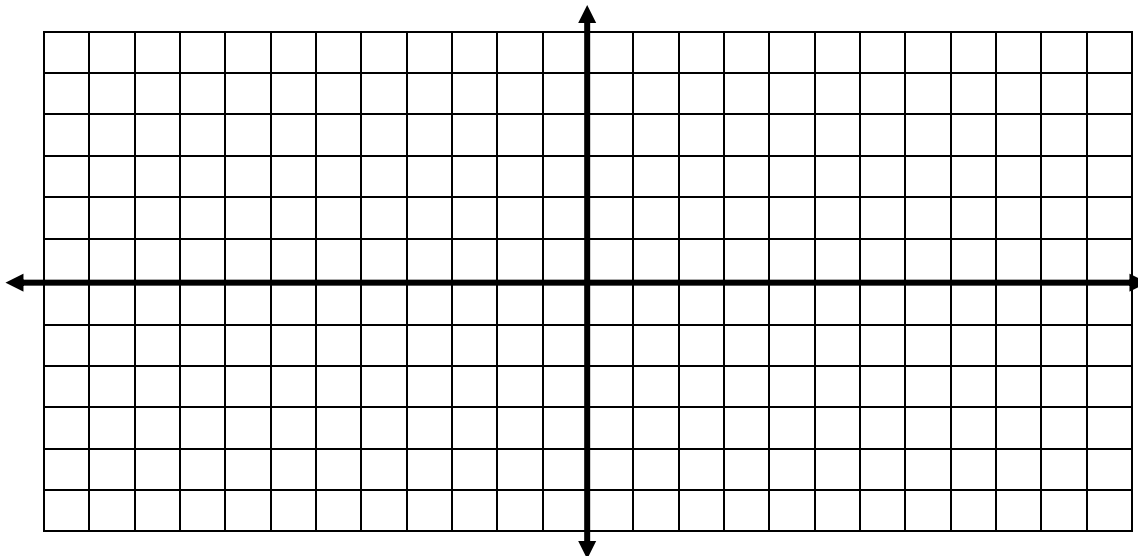
4b) Find the range of $g(x)$.

Range is _____

4c) List any intervals of increase or decrease below:

5. Graph the piecewise-defined function; use a one-to-one scale.

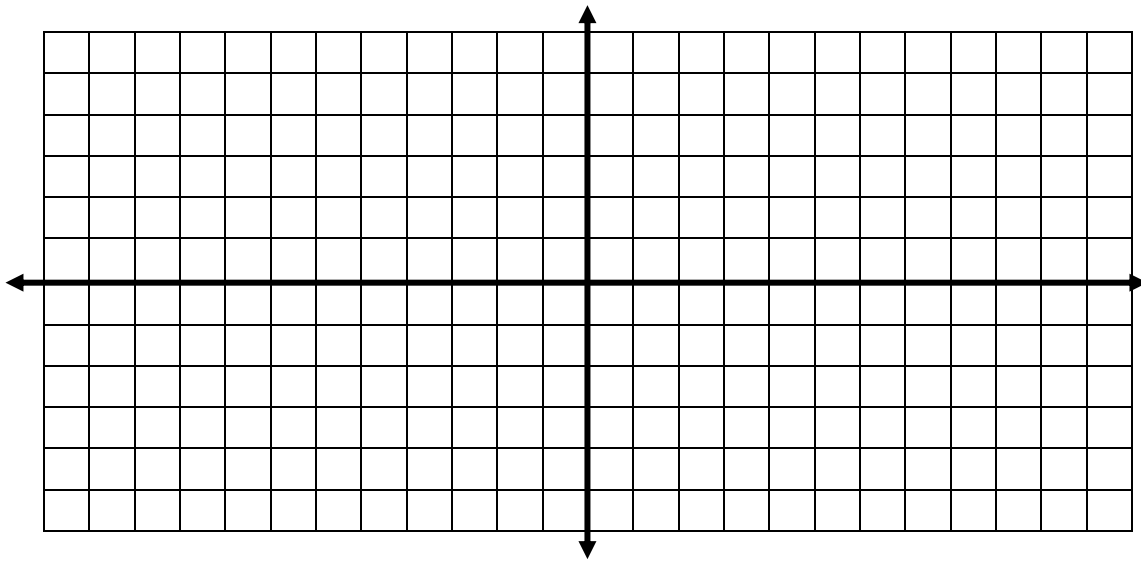
$$f(x) = \begin{cases} -2x - 5 & \text{if } x \leq -4 \\ -|x| + 3 & \text{if } -4 < x < 4 \\ 4 & \text{if } x \geq 4 \end{cases}$$



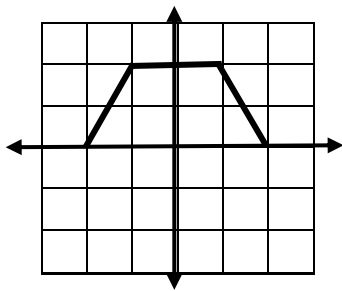
6. Given the general form of the equation of a circle, find the standard form of the equation of this circle, state its center and radius, and graph the circle.

GENERAL FORM: $x^2 + y^2 - 10x + 2y + 17 = 0$

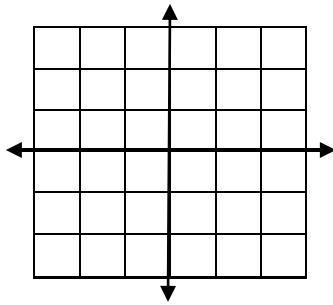
STANDARD FORM: _____, CENTER: _____ RADIUS: _____



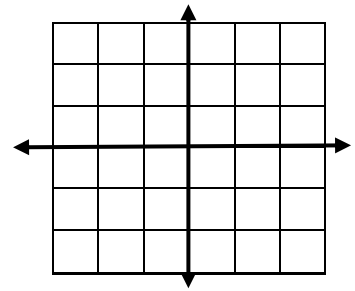
7. $f(x)$ is graphed on the left below, graph the requested transformations on the grids provided:



$f(x)$



$f(x) - 2$

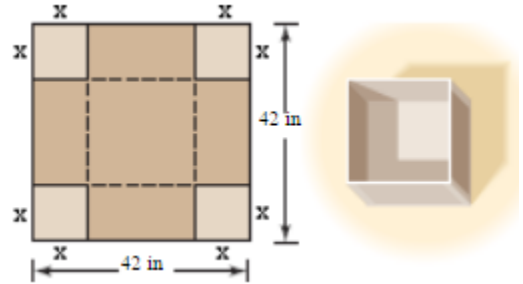


$\frac{1}{2}f(x + 1)$

8. An open box with a square base is to be made from a square piece of cardboard 42 inches on a side by cutting out a square from each corner and turning up the sides.

8a) Express the volume V of the box as a function of the length x of the side of the square cut from each corner.

8b) What is the volume if a 10-inch square is cut out?



9. A lifeguard has 100 meters of roped-together flotation devices with which to cordon off a rectangular swimming area. If the shoreline forms one side of the rectangle, what dimensions will maximize the size of the area for swimming?

10. A parabola is given by $f(x) = -2x^2 + 6x + 2$.

The axis of symmetry of this parabola is _____

The vertex of this parabola is _____

The standard form of the equation of this parabola is _____