Name: _____Caleb McWhorter — Solutions_____
MATH 111-I
Spring 2025
Quiz 8

Problem 1: If $f(x) = 5x + 8$ and $g(x) = x^2 - 4$, compute $(f \circ g)(-1)$.

We know that $(f \circ g)(-1) = f\big(g(-1)\big)$. But...

$$g(-1) = (-1)^2 - 4 = 1 - 4 = -3$$
$$f(-3) = 5(-3) + 8 = -15 + 8 = -7$$

Therefore, we have...

$$(f \circ g)(-1) = f\big(g(-1)\big) = f(-3) = -7$$

Problem 2: Consider the function $h(x) = 4(x + 5)^3$. Find functions $f(x)$ and $g(x)$ such that $h(x) = f\big(g(x)\big)$, i.e. write $h(x)$ as a composition of two functions.

There are infinitely many answers. For instance, we have...

$$f(x) = 4x^3$$
$$g(x) = x + 5$$

We can verify that this selection works:

$$f\big(g(x)\big) = f(x + 5) = 4(x + 5)^3 = h(x)$$

Problem 3: Compared to the graph of $f(x)$, what does the graph of $4 - f(x + 6)$ 'look like'?

We know that the graph of $f(x+6)$ is the graph of $f(x)$ shifted 6 units to the left. The graph of $-f(x+6)$ is the graph of $f(x+6)$ reflected through the x-axis. Finally, the graph of $4 - f(x+6) = -f(x+6) + 4$ is the graph of $-f(x + 6)$ shifted 4 units upwards. Therefore, the graph of $4 - f(x + 6)$ is the graph of $f(x)$ shifted 6 units to the left, reflected through the x-axis, and then shifted 4 units upward.

Problem 4: Does the function $f(x)$ given below have an inverse? Explain.
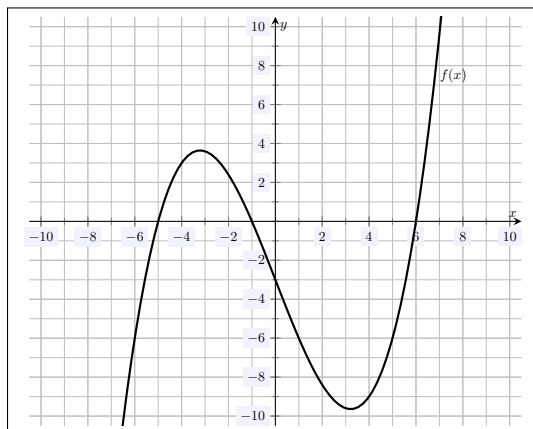
The function $f(x)$ does not have an inverse because the graph of $f(x)$ fails the Horizontal Line Test; that is, not every horizontal line intersects the graph of $f(x)$ at most once.