FULL NAME _____

ID NUMBER _____

1. (3 points) Given that $f(x) = 2x - 4$ and $g(x) = x^2 - 3x + 8$, find $(f \circ g)(-3)$.

   A. 0

   B. 23

   C. -953

   D. 48

   E. 10

2. (4 points) Use an *algebraic* test to determine if the graph of the function $f(x) = x^2 + 5$ is symmetric with respect to the *y-axis*.

   Solution. Suppose (x_0, y_0) is a point on the graph of f. Then the point $(-x_0, y_0)$ is also on the graph of f, since $(-x_0)^2 + 5 = x_0^2 + 5 = y_0$. So the graph of f is symmetric with respect to the y-axis.

3. (3 points) Suppose you are given the graph of the function $g(x) = x^2$. How can the graph of the function $h(x) = x^2 - 6$ be obtained from the graph of $g(x)$?

   A. By translating the graph of $g(x)$ down 1 unit.

   B. By translating the graph of $g(x)$ down 6 units.

   C. By translating the graph of $g(x)$ to the left 4 units.

   D. By stretching the graph of $g(x)$ by a factor of 6 in the horizontal direction.

   E. By shrinking the graph of $g(x)$ by a factor of 1/6 in the vertical direction.

Total: _____/10

4. (0 points) **This question is for no points.** Happy Leap Day Eve! Leap Day is cool for numerous reasons, one of which is that 29 is a *prime number*. How many prime numbers can you list?

   $2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 79, 83, 89, 97, \ldots$

Another cool number fact related to the date: 28 is what's known as a *perfect number*. A rather silly name, yes. This is because 28 is equal to the sum of its proper factors. 28 has factors 1,2,4,7, and 14. And 1+2+4+7+14=28! Very cool.

USEFUL FORMULAS

- $m = \dfrac{y_2 - y_1}{x_2 - x_1}$
- $y = mx + b$
- $Ax + By = C$
- $y - y_1 = m(x - x_1)$
- $a^2 - b^2 = (a + b)(a - b)$
- $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
- $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
- $(a + b)^2 = a^2 + 2ab + b^2$
- $(a - b)^2 = a^2 - 2ab + b^2$
- $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
- $\left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$
- $(x - h)^2 + (y - k)^2 = r^2$
- $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
- $a^2 + b^2 = c^2$
- $a^m a^n = a^{m+n}$
- $a^0 = 1$
- $\dfrac{a^m}{a^n} = a^{m-n}$
- $(a^m)^n = a^{m \cdot n}$
- $(ab)^m = a^m b^m$
- $\dfrac{1}{a^n} = a^{-n}$
- $\left(\dfrac{a}{b}\right)^n = \dfrac{a^n}{b^n}, (b \neq 0)$