Loyola University Chicago **Quiz 1**
Math 161, Section 001, Fall 2010

Name (print): ______________________ **Signature:** ______________

You have 30 minutes. Show your work. Notes not allowed! Problems are on both sides of this sheet.

Problem 1. (6 pts) Consider the function $7 - 4\sin(13x)$.

a. What is its range?

Solution: $[7-4, 7+4]$, *hence* $[3, 11]$.

b. What is its period?

Solution: $\frac{2\pi}{13}$.

Problem 2. (5 pts) For the functions $f(x) = 3\sin\left(x^2\right)$ and $g(x) = 5e^x$, find the following:

a. $g(f(0)) =$

Solution: $f(0) = 0$, $g(f(0)) = g(0) = 5e^0 = 5$

b. $f(g(x)) =$

Solution: $f(g(x)) = f(5e^x) = 3\sin\left((5e^x)^2\right)$.

c. $\ln(2g(x)) - x =$ *Simplify the answer to* **c.***!*

Solution: $\ln(2g(x)) - x = \ln(10e^x) - x = \ln 10 + \ln e^x - x = \ln 10 + x - x = \ln 10$.

Problem 3. (5 pts) The half-life of a certain radioactive substance is 12 hours. There are 8 grams present initially.

a. Express the amount of substance remaining as a function of time t.

b. When will there be 1 gram remaining?

Problem 4. (4 pts) If the domain of $f : \mathbb{R} \to \mathbb{R}$ is $[0, \infty)$ and $g(x) = x^2 + x - 6$, find the domain of $f(g(x))$.

Solution: domain of f is $[0, \infty)$, hence for $f(g(x))$ to make sense, we must have $g(x) \geq 0$. So $x^2 + x - 6 \geq 0$, which means $x \leq -3$ or $x \geq 2$. Said differently, the domain of $f(g(x))$ is $(-\infty, -3]$ and $[2, \infty)$.