Math activity 1: complex numbers Name: _____

1. Write the following in the form $a + ib$, i.e., the sum of a real and imaginary number

   a $(\sqrt{3} + i)^2$

   b $(\sqrt{3} + i)^{10}$

   c i^i

2. What is $\sin(3\theta)$ in terms of $\cos(\theta)$ and $\sin(\theta)$?

3. Describe the behavior of the function $f(t) = e^{iwt}$ with a diagram and a few words.

4. Evaluate $|f(t)|^2$.

5. Describe the behavior of the function $g(t) = e^{iwt} + e^{2iwt}$ with a diagram and a few words.

6. Evaluate $|g(t)|^2$ (express in terms of trigonometric functions).

7. Let $h(x) = 1 + i\epsilon x$ where $\epsilon \ll 1$ is a real number. Evaluate $|h(x)|^2$ to first order in ϵ.