

**Math 444 - Homework 11****Name:** \_\_\_\_\_

Find Taylor series for the following functions with the given centers.

1.  $f(x) = \frac{\sin(z^3)}{z^2}$  centered at 0.

2.  $f(x) = \frac{1}{z + 2i}$  centered at 0.

3.  $f(x) = \text{Log}(z + 2i)$  centered at 0. Hint integrate the last Taylor series!

4. Use the Taylor series formula  $f(z) = \sum_{n=0}^{\infty} \frac{f^{(n)}(c)}{n!} (z - c)^n$  to find the Taylor series for  $e^z$  centered at  $c = \pi i$ .

5. Use the ratio test to find the radius of convergence of the power series  $\sum_{n=0}^{\infty} \frac{(z - i)^n}{(n + 1)3^n}$ .

6. Find a closed form expression (not an infinite sum) for the sum of this power series:

$$z^2 - 3z^4 + 5z^6 - 7z^8 + \dots$$

Hint: if you factor out  $z^2$ , then the resulting sum has a nice integral.