Homework 4 for MATH 185

Due: Wednesday February 21, 3:10 pm in class

Problem 1

For $r = 1, 3, 5$ compute the following integral:

$$\oint_{|\xi-2|=r} \frac{\exp(\xi^2)}{(\xi^2 - 6\xi)} d\xi.$$

Problem 2

We will prove that the Cauchy integral formula holds in a much more general form. In particular,

$$f'(z) = \frac{1}{2\pi i} \oint_{|\xi-z_0|=r} \frac{f(\xi)}{(\xi - z)^2} d\xi,$$

for every z with $|z - z_0| < r$.

Use this to show that if $f : \mathbb{C} \to \mathbb{C}$ is analytic and $\lim_{z\to\infty} f(z)/z = 0$, then f is constant.