Math 444 - Cauchy's Formula for Derivatives **Name:** _____

1. Compute $\displaystyle\int_{|z|=4} \frac{\exp(3z)}{(z-\pi i)^2}\,dz$

2. Compute $\displaystyle\int_{|z|=1} \frac{\cos(2z)}{z^3}\,dz$

Integrate the following functions over the circle of radius 3 around the origin.

3. $\mathrm{Log}(z-4i)$

4. $\dfrac{z}{z-\frac{1}{2}}$

5. $\left(\dfrac{\cos z}{z}\right)^2$

6. $\dfrac{\exp(2z)}{(z-1)^2(z-2)}$

7. Let $p(z) = (z - \frac{1}{2})(z - 2)(z - \frac{i}{2})$. What is the winding number of the path $\gamma_1(t) = p(e^{it}), 0 \leq t \leq 2\pi$ around the origin? What about the path $\gamma_2(t) = p(3e^{it}), 0 \leq t \leq 2\pi$?

8. What is the winding number of the path $\gamma(t) = 2e^{3it} + 5e^{2it} - 3e^{it}$, $0 \leq t \leq 2\pi$ around the origin? Hint: $\gamma(t)$ is a polynomial function of e^{it}. What are the roots of that polynomial?