Name: ____

Please show all work and explain your answers.

- 1. Let $f(z) = (\operatorname{Re} z)^2 + (\operatorname{Im} z)^2 2i \operatorname{Re} z \operatorname{Im} z$. At which z is f(z) complex differentiable? Analytic? Explain.
- 2. Integrate Im z dz along the straight line segment from the origin to 3i 4.
- 3. Integrate $\frac{e^z}{2z^2 + z} dz$ counterclockwise around the unit circle.
- 4. Expand 1/z in a Taylor series at z = 3i 4. What is the disc of convergence?
- 5. Expand $(z^2 3iz 2)^{-1}$ in a Laurent series centered at the origin and valid in the annulus $\{z : 1 < |z| < 2\}.$
- 6. Integrate $\sin(\csc z)$ around the unit circle.
- 7. Use Rouché's theorem to determine the number of zeros, counted with multiplicity, of $z^3 8z^2 + 11z 1$ in the annulus $\{z: 1 < |z| < 2\}$.
- 8. Find a fractional linear transformation that maps the unit disc to the exterior of the circle of radius 2 centered at i.

1	2	3	4	5	6	7	8	total (80)