Mathematics 522 In Class Portion of Final Name: _____

Show your work! Answers that do not have a justification will receive no credit.

1. (15 Points) State or define the following:
   (a) The principle value of $\mathrm{Arg}(z)$.

   (b) The Cauchy integral theorem.

   (c) The Cauchy integral formula.

   (d) The Cauchy-Riemannian equations.

2. (5 Points) Let $f = u + i\,v$ be analytic in the domain D. Then use the Cauchy-Riemannian equations to show that u is harmonic in D.

3. (20 Points) Compute the following

(a) $e^{\frac{-\pi}{3}i}$ _____

(b) $(1+i)^{10}$

(c) $\arg(\sqrt{3}-i)$ _____

(d) $\log(4-4i)$ _____

(e) The principle value of i^{2i} _____

(f) all the cube roots of -27. _____

4. (10 Points) Find the harmonic conjugates of $u = 2x^2 - 2y^2 - 6xy + 2x + y$

Have a nice summer!