This homework covers material on comparisons and symmetry.

1. There is a simple (if hard to verbalize) rule by which every word on this list is equivalent to one or more other words. Find the rule and cluster the words accordingly.
   valley civic suffer
   speech services seemed
   scenes rotor majestic
   level jealousy estate
   errors dueled deprived
   declined assist clinic

2. Is \( f(x) = x^4 - x^3 \) symmetric? Explain.

3. Show \( f(x) = 8 \max\{0, x, -4 - x\} - x^2 - 4x \) is even-symmetric under reflection about \( x = -2 \).

4. Use successive differentiation to determine any possible points of symmetry for the following function. Use substitution to confirm whether or not the function is symmetric, and if so, whether the symmetry is odd or even.
   (a) \( f(x) = -5x^3 - 15x^2 - 7x + 4 \).
   (b) \( f(x) = x^3 - 15x^2 - 8x + 4 \).
   (c) \( f(x) = -4x^4 - 32x^3 - 94x^2 - 120x - 52 \).

5. Does the curve given by \( x^3 - 3xy^2 = 0 \) have any symmetries? Explain your answer convincingly.

6. Describe all symmetry points of the following repeated tiling of the plane. Mark any lines of reflection and centers of rotational symmetry. Determine if the repeating pattern is triangular, 4-sided, or hexagonal, and outline one minimal tile (ignoring color differences).

7. Given a real-world example of reflection symmetry, rotational symmetry, and translational (periodic) symmetry different from all your classmates. Classify each appropriately.

8. A function \( F(x, y) \) is rotationally invariant if it is the same no matter how you rotate the axes about the origin. Find a mathematical test to determine when a function is rotationally invariant.