Exam 1

1. Traces are of the form $x = k,\ y = k\ldots$, not only "$x = 0,\ y = 0\ldots$. In some cases, you must analyse according to the sign of k. See also CC 7.

2. Continuous at (a,b) means the limit of f as $(x,y) \to (a,b)$ is $f(a,b)$. Other than at the origin, f is a rational function. Where are these functions known to be continuous?
At the origin, you must either show that $f(x, y) \to f(a, b)$ as $(x, y) \to (0, 0)$, or (i) that the limit fails to exist, or (ii) that the limit exists and is not equal to $f(a, b)$. What can you conclude if you show that, along a certain path, the limit is not equal to $f(a, b)$?
For limits along paths, I have shown how to examine them (i) without using the "lim" symbol and (ii) using parametrisation. I have asked you to do the same. It will greatly please me if you oblige.

3.

   (a) This should read: find $\dfrac{\partial z}{\partial x}, \dfrac{\partial z}{\partial y} : z = f(x) + g(y)$. For some reason, the printer renders this line differently from my pdf viewer.

   (b) You must either compute both w_{uv} and w_{vu}, or, having computed one, verify that the hypothesis of a certain theorem holds, and conclude that the other must be the same. See (c) below. Also, you must simplify the answers, so that each is of the form a certain polynomial in u, v divided by a fractional power of $1 + uv^2$.

   (c) We have a theorem on when the mixed second partial derivatives f_{xy} and f_{yx} agree. State the theorem and verify that the hypothesis holds, then conclude.

4.a) See CC 6. To verify that certain functions (here, the first partial derivatives) are continuous, refer to the fact that certain types of functions are continuous over their domain, and explain which case applies.

5. Complete the square.

6. See CC 8.