EXAM 3 - MATH 251 YOUR NAME:

Read each problem **very carefully** before starting to solve it. Each problem is worth 5 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Write the domain of $f(x, y) = \frac{y-2}{\sqrt{x-2}}$ in set notation. Then show with explanations that $\lim_{(x,y)\to(4,2)} f(x,y)$ does not exit.



2. Let $f(x,y) = x \ln (x+y)$ and $g(s,t) = e^{st-s^2t^3}$. Calculate the values of $f_x(1,2)$ and $g_t(3,0)$.

3. Let
$$z = f(x, y) = \frac{x^2}{y^2 + 1}$$
.

(a) Find a formula for the total differential dz at an arbitrary point (a, b).

(b) Find a formula for the linearization L(x, y) of f near the point (a, b) = (4, 1).

4. Find
$$\frac{\partial R}{\partial u}$$
 and $\frac{\partial R}{\partial v}$ if $R(x,y) = (3x+4y)^5$, $x = u^2$ and $y = uv$.

5. Giora and Rina are running towards the point P along straight paths that form a fixed angle $\theta = \frac{\pi}{3}$. Giora runs with velocity $v_a = 4$ m/s and Rina with velocity $v_b = 3$ m/s. Recall, using the Law of Cosines, that the distance between the two, when Giora is x meters from P and Rina is y meters from P, is given by $f(x, y) = \sqrt{x^2 + y^2 - 2xy \cos \theta}$. How fast is the distance between Giora and Rina changing when x = 30 m and y = 20 m?

