234 Quiz 8

Section: *Name:*

5 pts for each. 20 minutes. Bonus on back.

1. Consider $f(x, y) = \ln(1 + x)2^y$.

   (a). Compute the Taylor expansion of f about $(0, 0)$ up to second order.

   (b). Let $g(x, y) = \ln(1+x^2)2^{y^3}$. Can you figure out $g_{xx}(0, 0), g_{xy}(0, 0), g_{yy}(0, 0)$ without computing $g_{xx}(x, y), g_{xy}(x, y), g_{yy}(x, y)$? (Hint: No computation is needed. Use the result in (a) and do substitution.)

2. $f(x, y)$ is differentiable(and hence continuous) and satisfies that $f_x(x, y) = f_y(x, y) > 0$ for all points (*Caution: this doesn't mean* $f_x = f_y$ *is a constant*). Inside the unit disk $x^2 + y^2 \le 1$, does f have a global maximum and a global minimum? If yes, find them. (This is an old exam problem. For the boundary extremum, use Lagrange multiplier.)

(Bonus 2. 1 pt for each) Solve the integrals (I'm not expecting you to solve them all. Choose the ones you feel good to solve.)

a. $\int \frac{\sqrt{y^2-49}}{y} dy$

b. $\int_0^1 \ln x dx$

c. $\int \frac{1}{(x+1)(x^2+1)} dx$