- PRINT NAME

- Write version on your blue book and
  hand in this exam inside your blue book.   VERSION B

- Put your name, ID number, and section number (or time) on your blue book.

- You may have ONE PAGE of notes. NO CALCULATORS are allowed.

- **You must show your work to receive credit.**

1. (24 pts.) Suppose $g(x, y)$ is "well behaved" (that is, you can differentiate it as much as you want and those derivatives are continuous), $x = 2s + t$ and $y = s - t$.

   (a) Express $\dfrac{\partial g}{\partial s}$ in terms of g_x and g_y ONLY.

   "ONLY" means that neither s nor t should appear in your answer.

   (b) Express $\dfrac{\partial^2 g}{\partial s\, \partial t}$ and $\dfrac{\partial^2 g}{\partial t\, \partial s}$ in terms of g_{xx}, g_{xy} and g_{yy} ONLY.

For problems 2, 3, and 4 $f(x, y) = x^2 + y^3 + y^2 + 4xy$.

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2. (36 pts.) (a) For what value of $\mathbf{u}$ is $D_{\mathbf{u}}f(0, 1)$ a maximum?
   (b) What is the maximum value of $D_{\mathbf{u}}f(0, 1)$?
   (c) Find a value of $\mathbf{u}$ so that $D_{\mathbf{u}}f(0, 1) = 0$.

3. (12 pts) Find the tangent line to the level curve $f(x, y) = 2$ at $(0, 1)$.

4. (28 pts) (a) Find the critical points of $f(x, y)$.
   (b) Use the second derivative test to classify them.

END OF EXAM

Final Exam: 11:30 Wed. 12/11 in **YORK 2722**