Name: _____

1. **[1 point]** Compute the indicated function value.

   $f(x,y) = (x-y^2)^3 - \dfrac{xy}{x+y} \quad f(6,3)$

2. **[1 point]** Describe the domain of the function $g(x,y) = \dfrac{\ln(x^2+y)}{x}$.

OVER →

3. **[4 parts, 1 point each]** Let $f(x, y) = x^2 - 2xy^2 + y^3$.

   (a) Find the first partials $f_x(x, y)$ and $f_y(x, y)$.

   (b) Find the critical point(s) of $f(x, y)$.

OVER →

(c) Find the second partials $f_{xx}(x, y)$, $f_{xy}(x, y)$, $f_{yx}(x, y)$, and $f_{yy}(x, y)$.

(d) Where possible, use the second partials test to classify the critical point(s) of $f(x, y)$.

OVER →

4. **[2 points]** Find the first-order partial derivatives of $g(x, y) = \sqrt{x}e^{xy^2}$.

5. **[2 points]** Use the linear approximation of the given function at $(2, 4)$ to approximate $f(1.8, 4.1)$.
   $f(x, y) = \dfrac{xy}{y + 1}$