Name _____

Homework 10
Section 14.4

1. (5) Find the directional derivative of $f(x, y) = x^2 \ln y - xy^2$ at the point $(3, 1)$ in the direction of $\vec{v} = 2\vec{i} + 5\vec{j}$.

2. (5) Compute the gradient of $g(x, y) = y \sin(x^2) + \dfrac{xy^3}{\sqrt{\pi}}$ at $\left(\frac{\sqrt{\pi}}{2}, \sqrt{\pi}\right)$.

3. (5ea) You are at the point corresponding to $(1, -2)$ in a valley whose elevation at a point (x, y) is given by the function $h(x, y) = \dfrac{x + y}{1 + x^2}$. [Give your answer as a vector for the following questions.]

   (a) In what direction should you head in order to descend the fastest?

   (b) In which direction can you head in order to stay at the same elevation?