MA104 - Differential Calculus
Lesson 47: Directional Derivatives

1. Find the rate of change of f at P in the direction of the vector $\mathbf{v}$. Remember, the directional derivative requires a *unit* vector! You should be able to do these by hand, and check your work in Mathematica.

   (a) $f(x, y) = 4xy^2 - 5yx$, $P(1, 2)$, $\mathbf{v} = \langle 2, 3\rangle$.

   (b) $f(s, t) = s^3 e^{st}$, $P(0, 1)$, $\mathbf{v} = \langle 1, 3\rangle$.

   (c) $f(x, y) = \sin(xy) + y^4$, $P(4, 8)$, $\mathbf{v} = \langle 0, 1\rangle$.

   (d) $f(x, y, z) = x\cos(y)\sin(z)$, $P\left(1, \pi, \frac{\pi}{4}\right)$, $\mathbf{v} = 2\mathbf{i} - \mathbf{j} + 4\mathbf{k}$.

2. Do problem 2 in section 14.6, page 920. (See Ex. 1 Page 911 for a similar example.)

3. If you finish early, work on do problems from Lessons 47-48 and/or finish problem 4 from yesterday's worksheet.