Difficulty guide for worksheet:	
C-level or B-level exam problem:	1, 3, 4, 5, 6
A-level exam problem or challenge for extra study:	2
beyond the scope and/or removed from syllabus:	none

1. Calculate all first derivatives for each function f.

(a) $f(x,y) = \cos\left(\dfrac{y}{x+y}\right)$

(b) $f(u,v) = \ln(u^2 + uv)$

(c) $f(x,y,z) = ze^{xz-x^2z^3}$

(d) $f(s,t) = \tan^{-1}(st^2)$

2. Calculate f_{xyxzy} for the following function.

$$f(x,y,z) = y\sin(xz)\sin(x+z) + (x+z^2)\tan(y) + x\tan\left(\frac{z+z^{-1}}{y-y^{-1}}\right)$$

3. Prove that there is no function f such that $f_x = xy^2$ and $f_y = -x^2y$.

4. Find an equation of the plane tangent to the graph of f at the indicated point.

(a) $f(x,y) = 3x^2y - x^3y^2$ at $(-1,1)$

(b) $f(x,y) = ye^{x/y}$ at $(\ln(2),2)$

5. Use a linear approximation to estimate the value of $\sqrt{\dfrac{9.2}{3.9}}$.

6. Let $f(x,y) = 3x^2 - xy - y^2 - 18x$. Find all points on the graph of f where the tangent plane is parallel to the indicated plane.

(a) the xy-plane

(b) the plane $2x - 5x + 2z = 1$