Use proper mathematical notation at all times.

1. A surface is given by $z = x^3 + x^2y + xy^2 + y^3$. Determine

   (a) $z_x(-1, 2)$

   (b) $z_y(-1, 2)$

   and then answer the following.

      i. State the slope of the tangent line to the surface at point $(-1, 2, 5)$ in the plane parallel to the yz-plane.

      ii. State the slope of the tangent line to the surface at point $(-1, 2, 5)$ in the plane parallel to the xz-plane.

      iii. At what rate is z changing at point $(-1, 2, 5)$ in the plane $y = 2$?

      iv. At what rate is z changing at point $(-1, 2, 5)$ in the plane $x = -1$?

2. For each of the following functions, determine (*i*) $\dfrac{\partial f}{\partial x}$ and (*ii*) $\dfrac{\partial f}{\partial y}$.

   (a) $f(x, y) = x^2 \cos y^3$

   (b) $f(x, y) = \sin(x^2 y^3)$

   (c) $f(x, y) = e^{x^2 y^4}$

   (d) $f(x, y) = e^{x^2 + y^4}$

   (e) $f(x, y) = e^{x^2 + y^4} \tan y^3$

   (f) $f(x, y) = e^{x^2} \cot(x^2 y^3)$

   (g) $f(x, y) = \ln(x^2 \, y^4)$

   (h) $f(x, y) = \dfrac{xy}{x + y}$

NOTE: In `Maple`, partial differentiation is no different from differentiation. Use `Maple` to check your answers to the above. For example,

`> f := x^2 * cos(y^3); `$\langle ret \rangle$		defines f as an expression
`> diff(f,x); `$\langle ret \rangle$		gives $\dfrac{\partial f}{\partial x}$
`> diff(f,y); `$\langle ret \rangle$		gives $\dfrac{\partial f}{\partial y}$
`> diff(f,x,y); `$\langle ret \rangle$		gives $\dfrac{\partial^2 f}{\partial y \partial x}$
`> diff(f,x$2); `$\langle ret \rangle$		gives $\dfrac{\partial^2 f}{\partial x^2}$