

1. TRUE or FALSE: *Briefly justify your answer!*
  - (a) There is a function  $P(x, y)$  such that  $\frac{\partial P}{\partial x} = y$  and  $\frac{\partial P}{\partial y} = x$ .
  - (b) There is a function  $Q(x, y)$  such that  $\frac{\partial Q}{\partial x} = y^2$  and  $\frac{\partial Q}{\partial y} = x^2$ .
  - (c) If  $L(x, y)$  satisfies  $\frac{\partial L}{\partial x} = a$  and  $\frac{\partial L}{\partial y} = b$ , with both  $a$  and  $b$  constant, then  $z = L(x, y)$  is the graph of a plane.
2. Suppose the temperature on a rectangular plate is given by  $T(x, y) = k(x^2 + y^2)$ , where  $T$  is in  $^{\circ}F$ ,  $x$  and  $y$  are in inches, and  $k$  is a constant (with appropriate units). Suppose further that your thermometer is moving at 3 inches per minute in the  $x$ -direction, and 2 inches per minute in the  $y$ -direction. How fast is the temperature reading changing when the thermometer is at the point  $(1, 2)$ ?