Problem statement a) Suppose that $z = f(x, y)$, that $x = g(t)$ and $y = h(t)$, and that the functions f, g, and h are twice differentiable. Use the Chain Rule to find an expression for $\frac{d^2 z}{dt^2}$.

b) An insect crawls on a metal plate in the plane. At time $t = 1$ its position vector is $\mathbf{i} + 2\mathbf{j}$, its velocity is $2\mathbf{i} - \mathbf{j}$, and its acceleration is $3\mathbf{i} + 4\mathbf{j}$. Suppose that the temperature of the plate at the point x, y is a certain function $T(x, y)$ satisfying

$$T(1, 2) = 2, \quad T_x(1, 2) = -1, \quad T_y(1, 2) = 3,$$
$$T_{xx}(1, 2) = 0, \quad T_{xy}(1, 2) = 1, \quad T_{yy}(1, 2) = -2.$$

If $T(t)$ is the temperature experienced by the insect at time t, find $\frac{dT}{dt}$ and $\frac{d^2 T}{dt^2}$ at time $t = 1$.