Example 1: Find the rate of change in the volume of a sphere if the radius is $\sin^2(t)$ at time t. We will start with finding the derivative of the volume equation, implicitly:

$$V = \frac{4}{3}\pi r^3$$
$$\frac{dV}{dt} = \frac{4}{3}\,\pi\,3\,r^2\,\frac{dr}{dt}$$
$$\frac{dV}{dt} = 4\,\pi\,r^2\,\frac{dr}{dt}$$

Next, we will find the derivative of the radius equation:

$$r = \sin^2(t)$$
$$r = \sin(t) * \sin(t)$$
$$\frac{dr}{dt} = \sin(t) * \cos(t) + \cos(t) * \sin(t)$$
$$\frac{dr}{dt} = 2\sin(t)\cos(t)$$

Knowing these two equations and the equation for r, we can substitute:

$$\frac{dV}{dt} = 4\pi r^2 * 2\sin(t)\cos(t)$$
$$\frac{dV}{dt} = 8\pi(\sin^2(t))^2\sin(t)\cos(t)$$
$$\frac{dV}{dt} = 8\pi\sin^5(t)\cos(t)$$