$P(t) = e + dt$

$f(p) = 0 \qquad f(e+dt) = 0$

Sphere eq: $(x-x_c)^2 + (y-y_c)^2 + (z-z_c)^2 - R^2 = 0$

$(P-C)\cdot(P-C) - R^2 = 0$

$(e+dt-c)(e+dt-c) - R^2 = 0$

$e^2 + edt - ec + dt^2 + edt - dtc + c^2 - ec - dtc - R^2 = 0$

$e^2 + d^2t^2 + c^2 + 2edt - 2ec - 2dtc - R^2 = 0$

$d^2t^2 + 2edt - 2cdt + e^2 + c^2 - R^2 = 0 \quad -2ec$

$(d\cdot d)t^2 + 2d(e-c)t + e^2 + c^2 - 2ec - R^2 = 0$

$a = d^2$

$b = 2d(e-c)$

$c = e^2 + c^2 - 2ec - R^2$

$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = x$

$$\frac{-2d(e-c) \pm \sqrt{(2d(e-c))^2 - 4 \cdot d^2 \cdot (e^2 + c^2 - 2ec - R^2)}}{2 \cdot d^2} = t$$