

1. The following equation for the temperature  $T = T(t)$  represents a spherical thermocouple with convective conditions and includes radiation exchange with its surrounding walls

$$c_2 \frac{dT}{dt} = -(T - T_\infty + c_1(T^4 - T_{sur}^4)).$$

In this equation,  $c_1 = 1.27575 \times 10^{-10} K^{-3}$  and  $c_2 = 0.991667s$ . If it is assumed that  $T_\infty = 473.15$ ,  $T_{sur} = 673.15K$ , and  $T(0) = 298.15K$ , determine the time  $t_s$  at which  $T(t_s) = 490.85K$ .