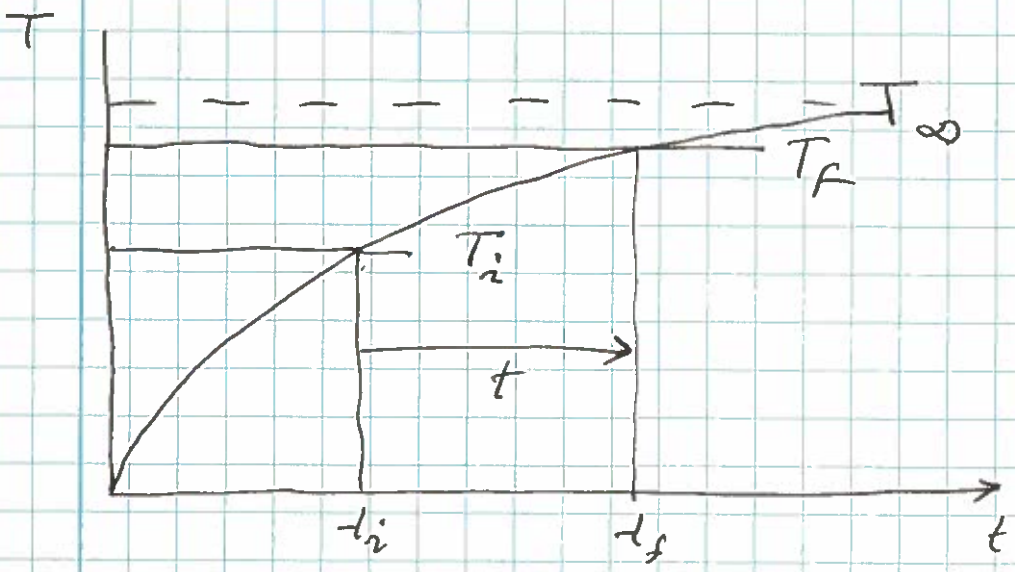
Lead glass cleaning



assume

$T_\infty = 0.5$

$T_f = 0.45$

$T_i = 0.4$

1) find t_i $\quad T_i = T_\infty\left(1 - e^{-t_i/p_1}\right)$ or $0.4 = 0.5\,(1 - e$

$-0.1 = -0.5\, e^{-t_i/p_1} \qquad e^{-t_i/p_1} = 0.2$

$\ln 0.2 = -0.7 \quad$ so $\boxed{t_i = 0.7 p_1}$

2) find $t_{tot} = t_i + t$

$$T_f = T_\infty\left(1 - e^{-(t_i + t)/p_1}\right) \text{ or } 0.45 = 0.5$$

or $\quad 0.45 = 0.5 - 0.5\, \underbrace{e^{-t_i/p_1}}_{0.2}\, e^{-t/p_1}$

$-0.05 = -\underbrace{0.5 \times 0.2}_{0.1}\, e^{-t/p_1}$ or $e^{-t/p_1} =$

$\boxed{t = 0.3 p_1}$

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p_1	t_i	t
2	1.4	0.6
2.5	1.75	0.75
3	2.1	0.9
3.5	2.45	1.05
4.0	2.8	1.2
5.0	3.5	1.5