$$\begin{pmatrix} c(t,t) & c(s,t) \\ c(t,s) & c(s,s) \end{pmatrix}$$

$k = c(t_2, t_0)$

$$\det = \left(c(t,t)c(s,s) - c(s,t)c(t,s) \right)$$

$$= \left(c(t_0,t_0)\left(k + \nabla c\begin{pmatrix} t \\ t \end{pmatrix}\right)\left(k + \nabla c\begin{pmatrix} s \\ s \end{pmatrix}\right)\right.$$

$$\left. - \left(k + \nabla c\begin{pmatrix} s \\ t \end{pmatrix}\right)\left(k + \nabla c\begin{pmatrix} t \\ s \end{pmatrix}\right)\right)$$

$$= k^2 + k\nabla c\begin{pmatrix} t \\ t \end{pmatrix} k + \underline{\qquad\qquad} = 0!$$

$$k^2 + k\nabla c\begin{pmatrix} t \\ t \end{pmatrix} + k\nabla c\begin{pmatrix} s \\ s \end{pmatrix} - k\nabla c\begin{pmatrix} s \\ t \end{pmatrix} - k\nabla c\begin{pmatrix} t \\ s \end{pmatrix}$$

$\nabla c = (d_1, d_2)$

$$+ \nabla c\begin{pmatrix} t \\ t \end{pmatrix}\nabla c\begin{pmatrix} s \\ s \end{pmatrix} k - \nabla c\begin{pmatrix} s \\ t \end{pmatrix}\nabla c\begin{pmatrix} t \\ s \end{pmatrix}$$

$$\left(t(d_1+d_2)\right)\left(s(d_1+d_2)\right) - \left(sd_1 + d_2 t\right)\left(td_1 + sd_2\right)$$

$$= ts\left(d_1^2 + 2d_1d_2 + d_2^2\right) - std_1^2 - s^2d_1d_2 - t^2d_1d_2 - tsd_2^2$$

$$= 2ts\,d_1d_2 - s^2d_1d_2 - t^2d_1d_2$$

$$= -(s-t)^2 d_1d_2$$

need the ∇^2 terms