$$= \lim_{h\to 0} \mathbb{E}\left[\frac{g_j(t+h_k)\, g_i(t)}{h} \right] \quad \text{as } \mathbb{E}g.$$

$$\operatorname{cov}(g_j(t+h), g_i(t)) \to 0 \,? \qquad \cancel{I + o(s-t)^2}$$

$$\boxed{I + A(s-t)^2 + \cdots}$$

$$g(t) = C_{tt}^{-1/2} \nabla f(t).$$

$$g_j(t+h) = C_{t+h\,t+h}^{-1/2} \nabla f(t+h).$$

$$\det\left(I - (I + A(s-t) + B(s-t)^2)^2 \right).$$

$$= \det(-2A(s-t) \cancel{} B(s-t)^2 + (A(s-t))^2)$$

so must have $A = 0$ (from the 2P result)

$\cancel{\& B = \operatorname{cov}(\nabla^2 f(t))}$ & $\det(B) = \cancel{\det \operatorname{cov}(\nabla^2 f(t))}$?

$$\cancel{g_j(t+h) = C_{t+h\,t+h}^{-1/2} (\nabla f(t) + \nabla^2 f(t) h + \cdots)}$$

$\cancel{\Rightarrow}$ cov

$$\operatorname{cov}(g_j(t+h), g_i(t)) = \mathbb{E}\left[\left(C_{t+h}^{-1/2} \nabla f(t+h)\right)_j \left(C_{tt}^{-1/2} \nabla f(t)\right)_i \right]$$

$$\to \cancel{I} \; \delta_{ij}$$

$\operatorname{cov}(g(t))$ is cts so