$$\det\operatorname{cov}\Big(\big(f'(t),\ f'(t) + f''(t)(s-t) + Z^1_{t,s}|s-t|^{1+\eta},$$
$$f'(t) + f''(t)(r-t) + \tfrac{1}{2}(r-t)^2 f'''(t) + Z^3_{t,r} \times (|r-t|^2)^{1+\eta} \big)\Big)$$

$$= \det\operatorname{cov}\Big(f'(t),\ f''(t)(s-t) + |s-t|^{1+\eta} Z^1_{t,s},$$
$$f''(t)(r-t) + \tfrac{1}{2}(r-t)^2 f'''(t) + Z^3_{t,r}|r-t|^{2+\eta}\Big)$$

$$= (s-t)^{2N}(r-t)^{2N}$$
$$\times \det\operatorname{cov}\Big(f'(t),\ f''(t) + |s-t|^{1+\eta} Z^1_{t,s},$$
$$f''(t) + \tfrac{1}{2}(r-t)^2 f'''(t) + Z^3_{t,r}(|r-t|)^{\eta}\Big)$$

$$= (s-t)^{2N}(r-t)^{2N} \det\operatorname{cov}\Big(f'(t) - f''(t) - |s-t|^{1+\eta} Z^1_{t,s}\Big)$$ mistake

$$f''(t) + |s-t|^{1+\eta} Z^1_{t,s},$$
$$\tfrac{1}{2}(r-t) f'''(t) + Z^3_{t,r}\,\cancel{(r-t)} - |s-t|^{1+\eta} Z^1_{t,s}\Big)$$

If can get rid of the Zs, then this becomes:
ie via an $o(1)$ argument.

$$= (s-t)^{2N}(r-t)^{2N}$$
$$\times \det\operatorname{cov}\Big(f'(t) - f''(t),$$
$$f''(t),\ \tfrac{1}{2}(r-t) f'''(t)\Big)$$

PTO