

c v

Sakurai 2-51

$$[x(t), x(0)] = [x(0) + \frac{p(0)}{m}t, x(0)] \text{ by 2.2.27}$$

$$= [x(0), x(0)] + [\frac{p(0)}{m}t, x(0)] = \frac{t}{m} [p(0), x(0)]$$

and by 2.2.23b, $[p_i, G(\vec{x})] = -i\hbar \frac{\partial G}{\partial x_i} \Rightarrow [p(0), x(0)] = -i\hbar$

Thus $[x(t), x(0)] = \frac{-i\hbar t}{m}$ ✓

(10)