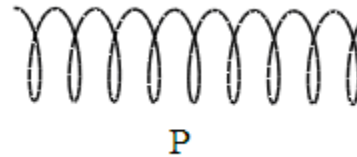
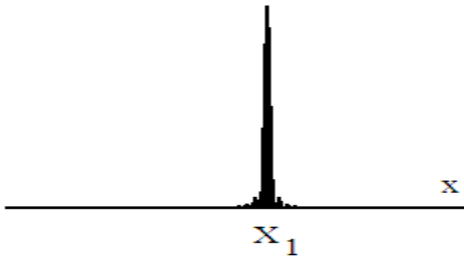


Relationship Between the Coordinate and Momentum Representations
 Frank Rioux
 College of St. Benedict | St. John's University

A quon has position x_1 : $|x_1\rangle$

Coordinate space \Leftrightarrow Fourier Transform \Leftrightarrow Momentum space

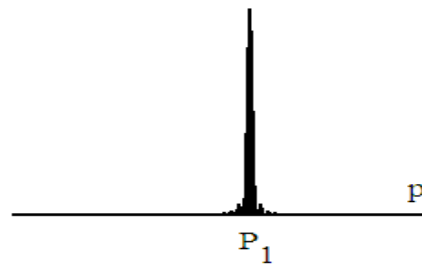
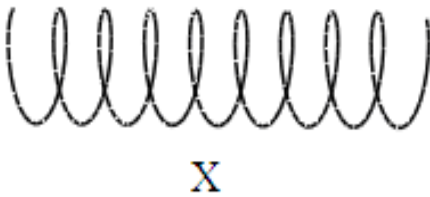
$$\langle x|x_1\rangle = \delta(x - x_1) = \frac{\int \langle p|x\rangle \langle x|x_1\rangle dx}{\int \langle x|p\rangle \langle p|x_1\rangle dp} \quad \langle p|x_1\rangle = \exp\left(-\frac{ipx_1}{\hbar}\right)$$



A quon has momentum p_1 : $|p_1\rangle$

Coordinate space \Leftrightarrow Fourier Transform \Leftrightarrow Momentum space

$$\langle x|p_1\rangle = \exp\left(\frac{ip_1x}{\hbar}\right) \quad \frac{\int \langle p|x\rangle \langle x|p_1\rangle dx}{\int \langle x|p\rangle \langle p|p_1\rangle dp} \quad \langle p|p_1\rangle = \delta(p - p_1)$$



Please note the important role that the coordinate and momentum completeness relations play in these transformations.

$$\int |x\rangle \langle x| dx = 1 \quad \text{and} \quad \int |p\rangle \langle p| dp = 1$$