Particle filter

$t = 3$

Compute weights

$$w_3^{(k)} \propto \frac{p\left(\mathbf{x}_{1:3}^{(k)}|\mathbf{y}_{1:3},\theta\right)}{q\left(\mathbf{x}_{1:3}^{(k)}|\mathbf{y}_{1:3},\theta\right)} = w_2^{(k)} \frac{p\left(\mathbf{y}_3|\mathbf{x}_3^{(k)}\right) p\left(\mathbf{x}_3^{(k)}|\mathbf{x}_2^{(k)}\right)}{q\left(\mathbf{x}_3^{(k)}|\mathbf{x}_2^{(k)},\mathbf{y}_3\right)}$$