Canonical commutation relation in one dimension:

$$XP - PX = i\hbar$$

Let

$$X = x, \quad P = -i\hbar\frac{\partial}{\partial x}$$

Then

$$\begin{aligned}
(XP - PX)\psi(x,t) &= XP\psi(x,t) - PX\psi(x,t) \\
&= x\left(-i\hbar\frac{\partial}{\partial x}\psi(x,t)\right) + i\hbar\frac{\partial}{\partial x}\big(x\psi(x,t)\big) \\
&= -i\hbar x\frac{\partial}{\partial x}\psi(x,t) + i\hbar\left(\frac{\partial}{\partial x}x\right)\psi(x,t) + i\hbar x\frac{\partial}{\partial x}\psi(x,t) \\
&= i\hbar\psi(x,t)
\end{aligned}$$

Eigenmath code:

```
X(f) = x f
P(f) = -i hbar d(f,x)
X(P(psi(x,t))) - P(X(psi(x,t)))
```

Result:

$$i\hbar\psi(x,t)$$