# Comparison: x² Regression vs. PINN for Flood Prediction

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| Aspect | x² Regression | PINN for Flood Prediction |
| Is the function known? | Yes — f(x) = x² | No — only the PDE is known |
| What do you provide? | Samples (x, y = x²) | Discharge samples Q(x,t) from stations |
| What does the network learn? | Function approximating x² | Function fitting data and PDE |
| Why are derivatives needed? | To "hint" that the function is quadratic | To compute PDE residuals |
| How are derivatives computed? | autograd on output | autograd on output |
| Do you provide the function? | No — only samples | No — only samples |
| Do you add physical knowledge? | Yes, via known derivative (2x) | Yes, via PDE residuals |
| What is the final goal? | Accurate generalization of simple law | Solving a PDE over a domain |