

Solving First Order ODE using Artificial Neural Networks

$dy/dx + A(x) * y = B(x)$, where: $A(x) = (x + (1 + 3x^2)/(1 + x + x^3))$

$$B(x) = x^3 + 2x + x^2 + ((1 + 3x^2)/(1 + x + x^3))$$

We write the ODE as: $dy/dx = f(x,y) = B(x) - A(x) * y$

Results:

The minimized cost function is: 0.2144

Optimized weights for input layer mapping to hidden layer (Theta1): $[[1.57677498 \ 0.18953889 - 0.06681273 -1.40984059 -1.75681045 -1.07765468 -0.49704399 \ 0.92659564 \ 1.05417781 \ 0.82356579]]$

Optimized weights for hidden layer mapping to output (Theta2): $[[-0.2478836 \ 0.55961154 \ 0.41933218 -1.58002545 -0.96626283 -1.09623086 -0.56424482 \ 0.2839247 -0.51294475 \ 1.42887284]]$

Plot showing results:

