4th Order Accurate Finite Difference Schemes

1st Derivative :

Scheme: -1:8:0:-8:1

$$F_x(i) = \frac{-F(i+2)+8F(i+1)-8F(i-1)+F(i-2)}{12\Delta x}$$ Interior Cells

Scheme: 1:-6:18:-10:-3

$$F_x(i) = \frac{F(i+3)-6F(i+2)+18F(i+1)-10F(i)-3F(i-1)}{12\Delta x}$$ Left Edge Cells

Scheme: 3:10:-18:6:-1

$$F_x(i) = \frac{3F(i+1)+10F(i)-18F(i-1)+6F(i-2)-F(i-3)}{12\Delta x}$$ Right Edge Cells

2nd Derivative :

Scheme: -1:16:-30:16:-1

$$F_{xx}(i) = \frac{-F(i+2)+16F(i+1)-30F(i)+16F(i-1)-F(i-2)}{12\Delta x^2}$$ Interior Cells

Scheme: -1:4:6:-20:-11

$$F_{xx}(i) = \frac{-F(i+3)+4F(i+2)+6F(i+1)-20F(i)-11F(i-1)}{12\Delta x^2}$$ Left Edge Cells

Scheme: 11:-20:6:4:-1

$$F_{xx}(i) = \frac{11F(i+1)-20F(i)+6F(i-1)+4F(i-2)-U(i-3)}{12\Delta x^2}$$ Right Edge Cells