ROLES AND RESPONSIBILITIES

- Developed 4^{th} order approximations of second order derivative of exp(x)*cos(x) using taylor table method.

- Developed matlab code to solve 1D convection equations using central difference, right hand skewed difference and left hand skewed difference methods.

- Plotted error between these approximations to identify most accurate finite difference method.

CODE AND RESULTS SNIPPET

b)Skewed Right Side scheme

$$\frac{\partial^2 f}{\partial^2 x} = \frac{a \cdot f(x) + b \cdot f(x + \Delta \cdot x) + c \cdot f(x + 2\Delta x) + d \cdot f(x + 3\Delta x) + e \cdot f(x + 4\Delta}{(\Delta x)^2}$$

equation (i)

To obtain the values of a,b,c,d,e we can use taylor's table.

	f(i)	f'(i)Δx	f''(i)(Δx)^2	f'''(i)(Δx)^2	f''''(i)(Δx)^2	f'''''(i)(Δx)^2	f''''''(i)(Δx)^2
a*f(i)	a	0	0	0	0	0	0
b*f(i+1)	b	b	b/2	b/6	b/24	b/120	b/720
c*f(i+2)	c	2c	2c	4/3c	2/3*c	4/15*c	4/45*c
d*f(i+3)	d	3d	4.5d	4.5d	27/8*d	81/40*d	81/80*d
e*f(i+4)	e	4e	8e	32/3*e	32/3*e	128/15*e	5.6889e
SUM	0	0	1	0	0	?	?

```
clc
clear all
close all
dx=linspace(1/40,1/20,25);
x=(pi/40);
analytical_function=exp(x)*cos(x);
for i=1:length(dx)
CDS_approx(i)=(-0.0834*(-2*exp(x-2*dx(i))*sin(x-2*dx(i)))+1.3337*(-2*exp(x-dx(i))*sin(x-dx(i)))-2.5005*(-2*ex
second_order_derivative(i)=-2*exp(x)*sin(x);
error_CDS(i)=abs(second_order_derivative(i)-CDS_approx(i));
FDS_approx(i)=(2.9280*(-2*exp(x)*sin(x))-8.7103*(-2*exp(x+dx(i))*sin(x+dx(i)))+9.5624*((-2*exp(x+2*dx(i))*sin
error_FDS(i)=abs(second_order_derivative(i)-FDS_approx(i));
BDS_approx(i)=(2.9336*(-2*exp(x)*sin(x))-8.7327*(-2*exp(x-dx(i))*sin(x-dx(i)))+9.5961*((-2*exp(x-2*dx(i))*sin
error_BDS(i)=abs(second_order_derivative(i)-BDS_approx(i));
end
subplot(2,2,1)
plot(dx,error_CDS,'k')
xlabel('dx values')
ylabel('Error values CDS')
title('CDS Error values Vs dx')
subplot(2,2,2)
plot(dx,error_FDS,'r')
xlabel('dx values')
ylabel('Error values FDS')
title('FDS Error values Vs dx')
subplot(2,2,3)
```