

ACTIVIDAD 1

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```
% %limpiar variables
```

Ecuación de la pendiente de Runge Kutta 2

$$\frac{dy}{dx} = (y+1)(x+1)\cos(x^2+2x), y(0) = 4$$

```
%%Valores Iniciales
x0 = 0;
y0 = 0;
h = 0.5;
xi = x0:h:2;
yi = zeros(1,length(xi));
yi(1) = 4;

%%Funciones base
solanali = @(x) 5*exp((1/2)*sin(x^2 + 2*x))-1;
funcion = @(x,y) (y+1)*(x+1)*cos(x^2+2*x);

%%Solución analitica
sol_ana = zeros(1,length(xi));
for i = 1:length(xi)
sol_ana(i) = solanali(xi(i));
end
```

Graficación de los diferentes resultados

```
hold on
title('Metodos RK2, aproximación')
%Solución Analitica
plot(xi,sol_ana,'-or');
%Metodo de Ralston
y = ralston(xi,yi,h,funcion,solanali);
```

```
error_r = 0
error_r = 3.1393
error_r = 36.5313
error_r = 34.7331
```

```
plot(xi,y,'-ob');
%Metodo de Heun
yh = heun(xi,yi,h,funcion,solanali);
```

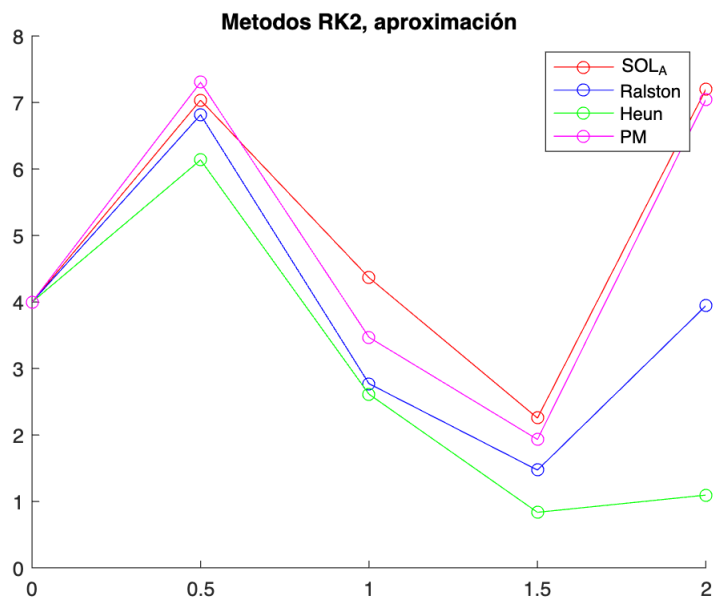
```
error_h = 0
error_h = 12.7792
```

```
error_h = 40.1546
error_h = 62.9178
```

```
plot(xi,yh,'-og');
%Metodo de Punto Medio
ym = medio(xi,yi,h,funcion,solanali);
```

```
error_pm = 0
error_pm = 3.8147
error_pm = 20.5578
error_pm = 14.2930
```

```
plot(xi,ym,'-om');
legend('SOL_A','Ralston','Heun','PM')
hold off
```



Metodo de Ralston

```
function y = ralston(x,y,h,f,fsolanali)
ysiguiente = @(y,k1,k2,h) y+((1/3)*k1+(2/3)*k2)*h;
%%Funciones
for i = 1:(length(x)-1)
    k1 = f(x(i),y(i));
    xis = x(i) + 0.75*h;
    yis = y(i) + 0.75*k1*h;
    k2 = f(xis,yis);
    y(i+1) = ysiguiente(y(i),k1,k2,h);
    error_r = abs(fsolanali(x(i))-y(i))/fsolanali(x(i))*100
end
end
```

Metodo de Heun

```

function y = heun(x,y,h,f,fsolanali)
    ysig = @(y,k1,k2,h) y + (((1/2)*k1)+((1/2)*k2))*h;

    %%Funciones
    for i = 1:(length(x)-1)
        k1 = f(x(i),y(i));
        xis = x(i) + h;
        yis = y(i) + (k1*h);
        k2 = f(xis,yis);
        valor_s = ysig(y(i),k1,k2,h);
        y(i+1) = valor_s;
        error_h = abs(fsolanali(x(i))-y(i))/fsolanali(x(i))*100

    end

end

```

Metodo de Punto Medio

```

function y = medio(x,y,h,f,fsolanali)
    ysig = @(y,k2,h) y + (k2*h);

    %%Funciones
    for i = 1:(length(x)-1)
        k1 = f(x(i),y(i));
        xis = x(i) + 0.5*h;
        yis = y(i) + k1*(h/2);
        k2 = f(xis,yis);
        valor_s = ysig(y(i),k2,h);
        y(i+1) = valor_s;
        error_pm = abs(fsolanali(x(i))-y(i))/fsolanali(x(i))*100
    end

end

```