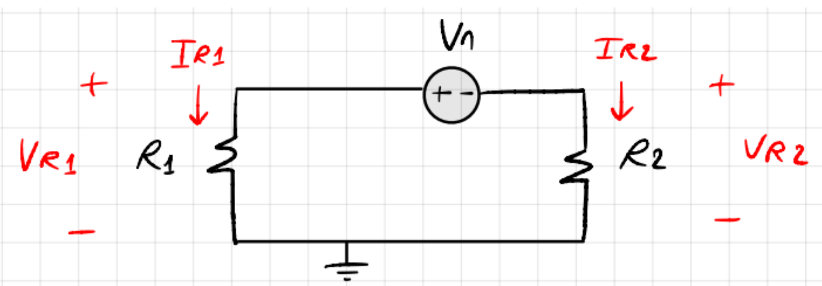
```
% Cambiar el intérprete a LaTeX
set(groot,'defaulttextinterpreter','latex');
set(groot, 'defaultAxesTickLabelInterpreter','latex');
set(groot, 'defaultLegendInterpreter','latex');
set(0,'defaultAxesFontSize', 13);
```

1. Modelo real (solución desarrollo exacto)

```
% Parámetros (ajusta según tu caso)
R2 = 50e3;       % Ohm
a = 100;        % unidades apropiadas
b = 10e3;        % unidades apropiadas
R1 = b;
k = 1.38e-23; % J/K
T = 300;      % Kelvin
IDC = linspace(0, 10, 101) * 1e-6;   % IDC biasing
%IDC = 1e-9
VR2_tmodel_square = zeros(size(IDC));
VR2_tideal_square = zeros(size(IDC));
```

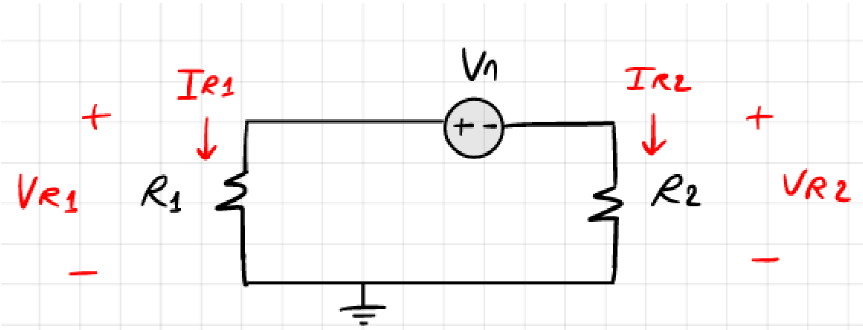



```
for j = 1:length(IDC)

    % Definir la ecuación V = I^2*a + I*b       I = 0;
    syms I
    eq = I*R2 + I^2*a + I*b - sqrt(4*k*T*(a*IDC(j) + b)) == 0;

    % Resolver simbólicamente (solo soluciones reales)
    I_sol = solve(eq, I, 'Real', true);

    % Mostrar soluciones
    %disp('Soluciones reales encontradas:');
    %disp(vpa(I_sol, 10));  % mostrar con más precisión
    % Verificar cada solución
    f = @(I) I*R2 + I.^2*a + I*b - sqrt(4*k*T*(a*I + b));

    for i = 1:length(I_sol)
        I_val = double(I_sol(i));
        residual = f(I_val);
        %fprintf('I = %.6e A --> f(I) = %.3e\n', I_val, residual);
    end
```

```
%
VR2_ideal = R2*I_val;
```

2. Solución con el modelo propuesto

2.1. Término debido a vn



$$V_{R1} - V_n - V_{R2} = 0 \rightarrow I_{R1} R_1 - \sqrt{4KTb} - V_{R2} = 0$$

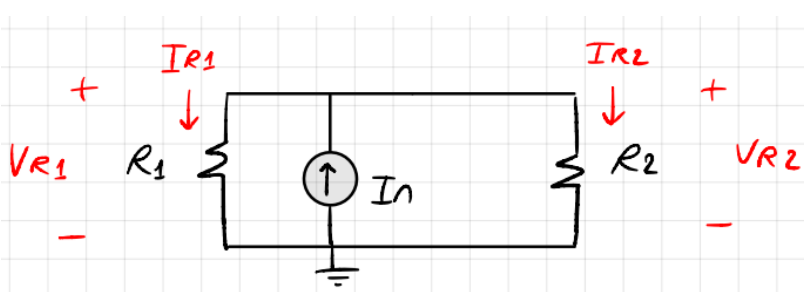
$$I_{R1} = -I_{R2} = -\frac{V_{R2}}{R_2} \Rightarrow$$

$$-\frac{R_1}{R_2} V_{R2} - \sqrt{4KTb} - V_{R2} = 0$$

$$V_{R2} = -\frac{\sqrt{4KTb}}{1 + \frac{R_1}{R_2}}$$

```
% Definir la ecuación
syms VR2_vn
VR2_vn_sol = sqrt(4*k*T*b)/(1 + R1/R2);
```

2.2. Término debido a In



$$I_n = I_{R_1} + I_{R_2} \longrightarrow \sqrt{4KT/b} = \frac{V_{R_1}}{R_1} + \frac{V_{R_2}}{R_2}$$

$$V_{R_1} = V_{R_2} \longrightarrow \sqrt{4KT/b} = V_{R_2}\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$$

$$V_{R_2} = \frac{\sqrt{4KT/b}}{\frac{1}{R_1} + \frac{1}{R_2}}$$

```
    % Definir la ecuación
    syms IR1_in
    VR2_in_sol = sqrt(4*k*T/b)/(1/R1 + 1/R2);
```

2.3. Cálculo de la parte real del coeficiente de correlación

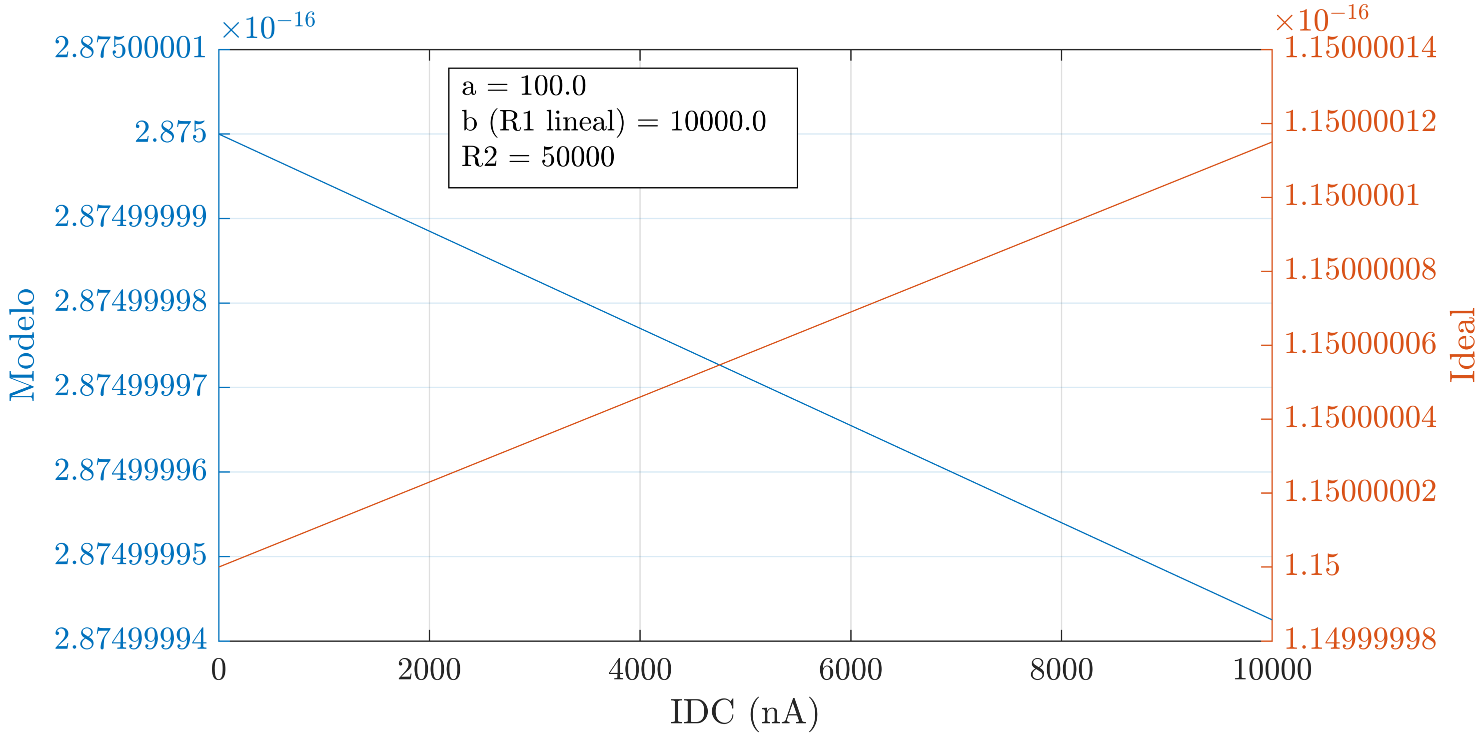
$$\xi = \frac{1}{2} - \frac{1}{4\frac{dV}{dI}} \frac{d^2V}{dI^2}\Big|_{I=0} I,$$

```
    epsilon = 1/2 - (1/(4*b))*2*a*IDC(j);    % duda: uso de IDC?
```

2.4. Comparación

```
    % IR1_in_vn_sol, VR2_vn_sol, VR2_in_sol

    VR2_tmodel_square(j) = VR2_vn_sol^2 + VR2_in_sol^2 +
epsilon*VR2_vn_sol*VR2_vn_sol;
    VR2_tideal_square(j) = VR2_ideal^2;
    % comp = VR2_ideal.^2-
(VR2_vn_sol(1).^2+VR2_in_sol(1).^2+epsilon*VR2_vn_sol(1)*VR2_in_sol(1))
    % vpa(comp)
end


fig = figure;
yyaxis left
plot(IDC * 1e9, VR2_tmodel_square)
ylabel('Modelo')
yyaxis right
plot(IDC * 1e9, VR2_tideal_square)
grid on
ylabel('Ideal')
xlabel('IDC (nA)')
str = sprintf('a = %.1f\nb (R1 lineal) = %.1f\nR2 = %i', a, b, R2);
annotation('textbox', [0.3, 0.7, 0.2, 0.2], 'String', str, ...
```

```
    'FitBoxToText', 'on', 'BackgroundColor', 'w', 'FontSize', 12,
'Interpreter','latex');
set(fig, 'Position', [100, 100, 800, 400]);
```




```
```