Electrical potential V(x) in the rectifying diode...

Physical constants

k_B	T	q
$(C \cdot V \cdot K^{-1})$	(K)	(C)
$8.617 \cdot 10^{-5}$	300	$1.602 \cdot 10^{-19}$

Basic parameters

N_V	E_b	σ	ε	V_d	d
(cm^{-3})	$(C \cdot V)$	$(C \cdot V)$	$(F \cdot m^{-1})$	(V)	(m)
$1 \cdot 10^{21}$	0.3	0.05	$4 \cdot 8.854 \cdot 10^{-12}$	0.6	$200 \cdot 10^{-9}$

Constants of the ODE

$$A := -2 \frac{k_B \cdot T}{2} N_V \cdot \exp\left(-\frac{1}{k_B \cdot T}\left(E_b - \frac{\sigma^2}{2 \cdot k_B \cdot T}\right)\right)$$

$$B := \frac{-1}{k_B \cdot T}$$

Guess Values

Domain (Distance from cathode)

$x := 0, 1 \cdot 10^{-9} .. 200 \cdot 10^{-9}\ m$

Constraints

The ODE to be solved

$$\left(\frac{d^1}{dx^1} V(x)\right)^2 - \left(\frac{d^1}{dx^1} V(0)\right)^2 = A \cdot \left(exp(B \cdot V(x)) - 1\right)$$

Boundary conditions

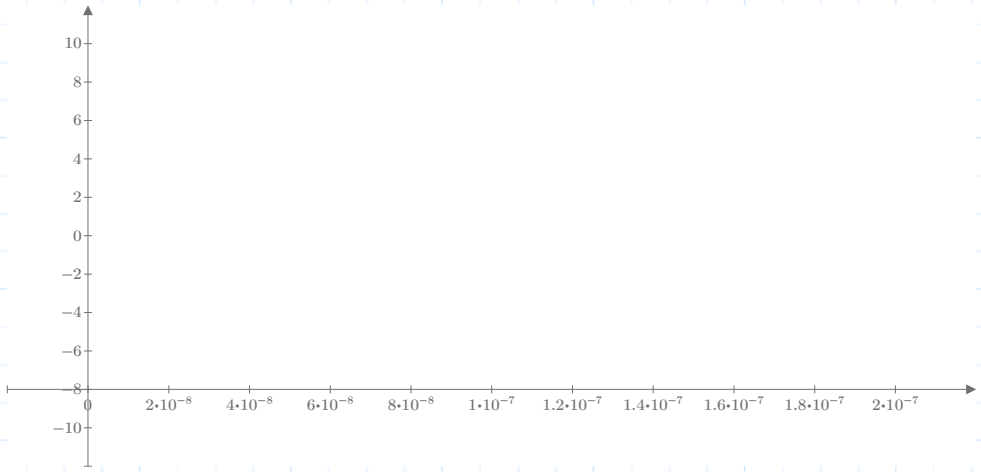
$V(0\ m) = 0\ V$

$V\left(200 \cdot 10^{-9}\ m\right) = -V_d\ V$

Solver

Resolution of the ODE

$V := \text{odesolve}\left(V(x), 200 \cdot 10^{-9}\right)$


10
8
6
4
2
0
−2
−4
−6
−8
−10
0
2•10⁻⁸
4•10⁻⁸
6•10⁻⁸
8•10⁻⁸
1•10⁻⁷
1.2•10⁻⁷
1.4•10⁻⁷
1.6•10⁻⁷
1.8•10⁻⁷
2•10⁻⁷

$V(x)$ (V)

x (m)