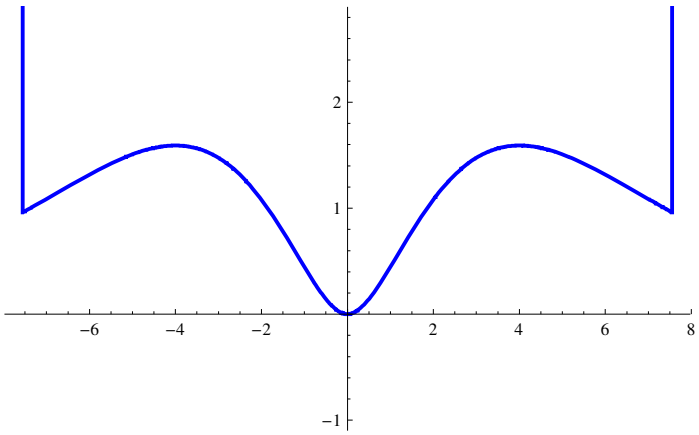
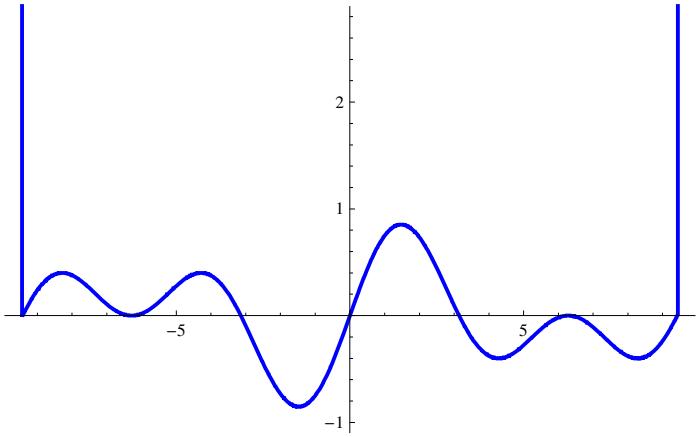
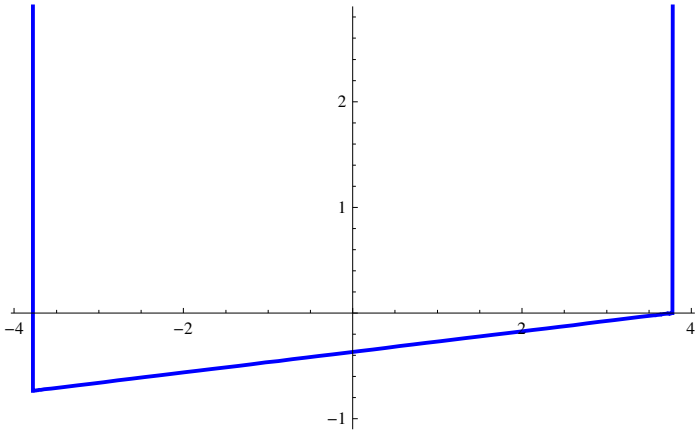
```
Clear["Global`*"];
Off[General::spell];
Off[General::spell1];

W = 3;
(* 1 a.u. of length = 0.5292 Å *)
clength = 0.5292;
(* 1 a.u. of energy = 27.211 eV *)
cenergy = 27.212;

(* z01 *)
(*  U(x) = V0*v(x); V0 = 20 eV, L = 4 Å; *)
L = 4. / clength;
A = -L; B = +L;
V0 = 20. / cenergy;
(* Whittaker function M_{k,m}(z) => WhittakerM[k,m,z] *)
U[x_Real] := If[Abs[x] < L, V0 * (WhittakerM[2, 1.5, Abs[x]]), W];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {-1.1, 2.9}]
```



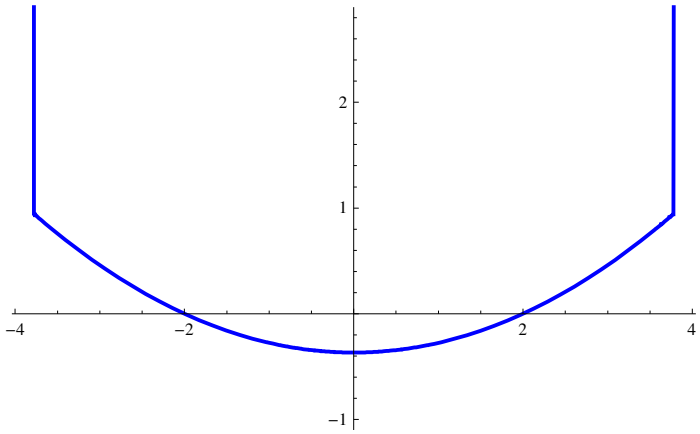
```
(* z02 *)
(*  U(x) = V0*v(x); V0 = 25 eV, L = 5 Å; *)
L = 5. / clength;
A = -L; B = +L;
V0 = 25. / cenergy;
U[x_Real] := If[Abs[x] < L, V0 * (Sin[x] * Cos[x / 4]), W];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {-1.1, 2.9}]
```



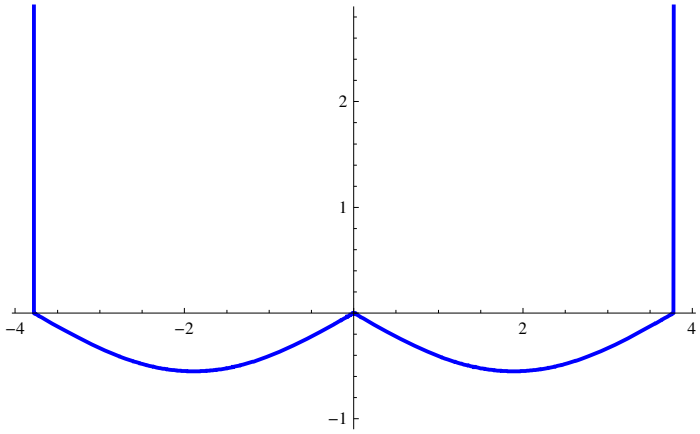

```
(* z03 *)
(*  U(x) = V0*v(x); V0 = 20 eV, L = 2 Å; *)
L = 2. / clength;
A = -L; B = +L;
V0 = 20. / cenergy;
U[x_Real] := If[Abs[x] < L, V0 * (-1 + (x + L) / (2 * L)), W];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {-1.1, 2.9}]
```



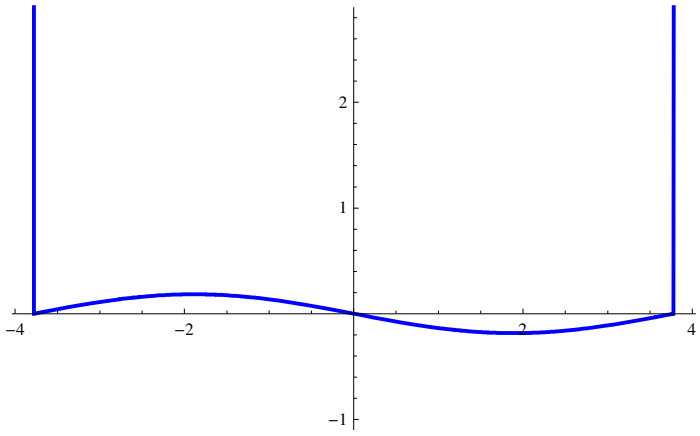
```
(* z04 *)
(*  U(x) = V0*v(x); V0 = 10 eV, L = 2 Å; *)
L = 2. / clength;
A = -L; B = +L;
V0 = 10. / cenergy;
U[x_Real] := If[Abs[x] < L, V0 * (0.25 * x^2 - 1), W];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {-1.1, 2.9}]
```



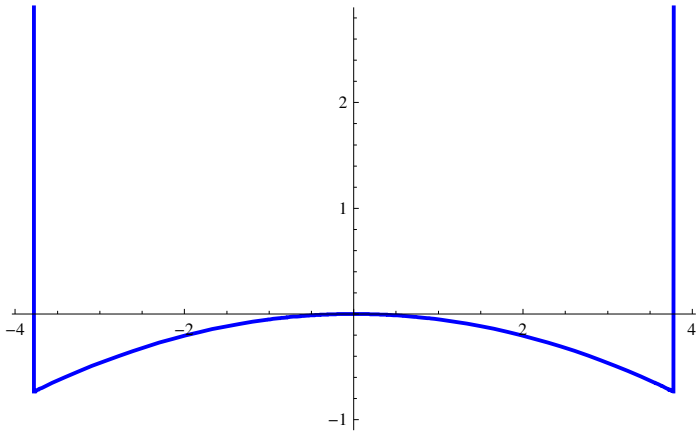

```
(* z05 *)
(*  U(x) = V0*v(x); V0 = 15 eV, L = 2 Å; *)
L = 2. / clength;
A = -L; B = +L;
V0 = 15. / cenergy;
U[x_Real] := If[Abs[x] < L, V0 * (-Abs[Sin[π * x / L]]), W];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {-1.1, 2.9}]
```



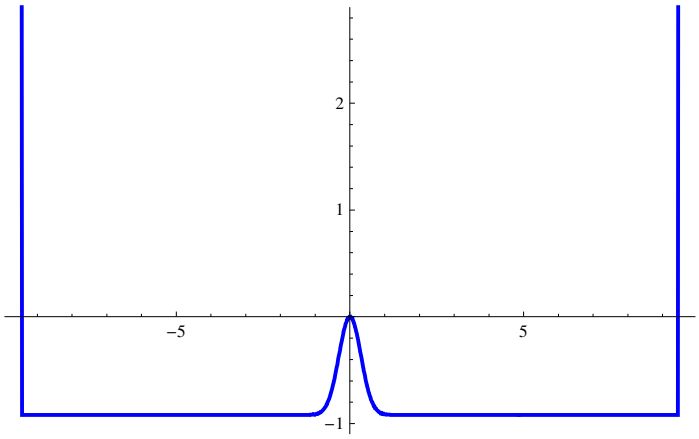
```
(* z06 *)
(*  U(x) = V0*v(x); V0 = 5 eV, L = 2 Å; *)
L = 2. / clength;
A = -L; B = +L;
V0 = 5. / cenergy;
U[x_Real] := If[Abs[x] < L, V0 * (-Sin[π * x / L]), W];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {-1.1, 2.9}]
```



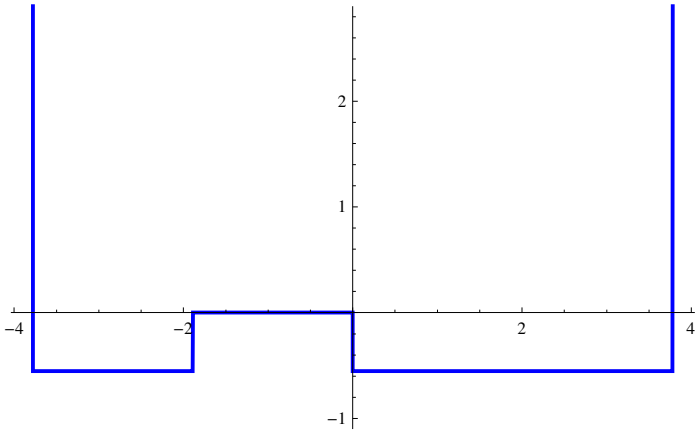

```
(* z07 *)
(*  U(x) = V0*v(x); V0 = 20 eV, L = 2 Å; *)
L = 2. / clength;
A = -L; B = +L;
V0 = 20. / cenergy;
U[x_Real] := If[Abs[x] < L, V0 * (-(x / L)^2), W];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {-1.1, 2.9}]
```



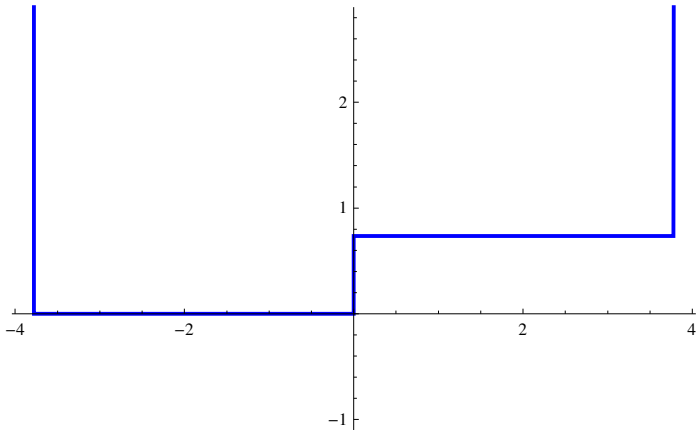
```
(* z08 *)
(*  U(x) = V0*v(x); V0 = 25 eV, L = 5 Å; *)
L = 5. / clength;
A = -L; B = +L;
V0 = 25. / cenergy;
U[x_Real] := If[Abs[x] < L, V0 * (-1 + Exp[-5 * x^2]), W];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {-1.1, 2.9}]
```



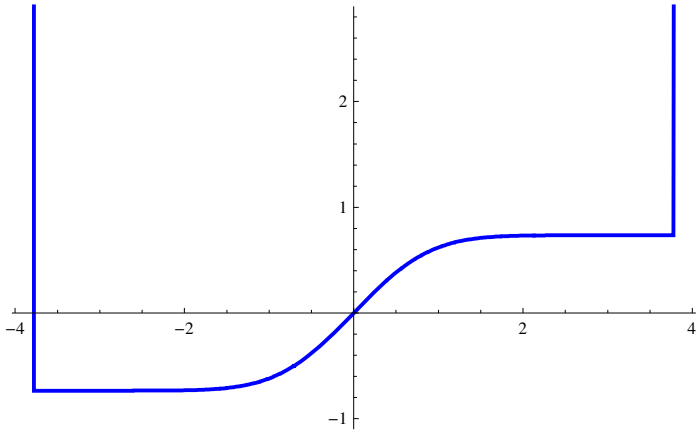

```
(* z09 *)
(*  U(x) = V0*v(x); V0 = 15 eV, L = 2 Å; *)
L = 2. / clength;
A = -L; B = +L;
V0 = 15. / cenergy;
U[x_Real] := Module[{res},
    If[x >= -L / 2. && x < 0, Return[0.]];
    If[(x >= -L && x < -L / 2.) || (x ≥ 0. && x < +L), Return[V0 * (-1.)]];
    If[x ≥ +L || x ≤ -L, Return[W]]];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {-1.1, 2.9}]
```



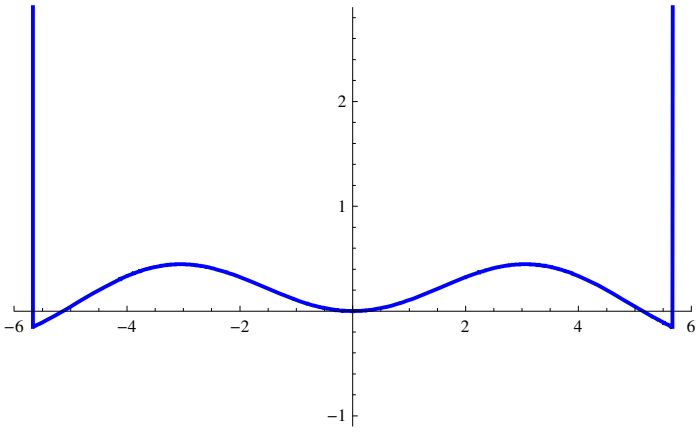
```
(* z10 *)
(*  U(x) = V0*v(x); V0 = 20 eV, L = 2 Å; *)
L = 2. / clength;
A = -L; B = +L;
V0 = 20. / cenergy;
U[x_Real] := If[Abs[x] < L, V0 * (HeavisideTheta[x]), W];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {-1.1, 2.9}]
```



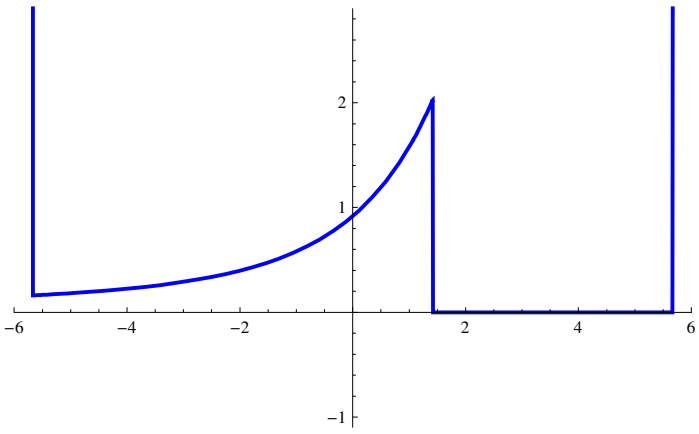

```
(* z11 *)
(*  U(x) = V0*v(x); V0 = 20 eV, L = 2 Å; *)
L = 2. / clength;
A = -L; B = +L;
V0 = 20. / cenergy;
U[x_Real] := If[Abs[x] < L, V0 * (Erf[x]), W];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {-1.1, 2.9}]
```



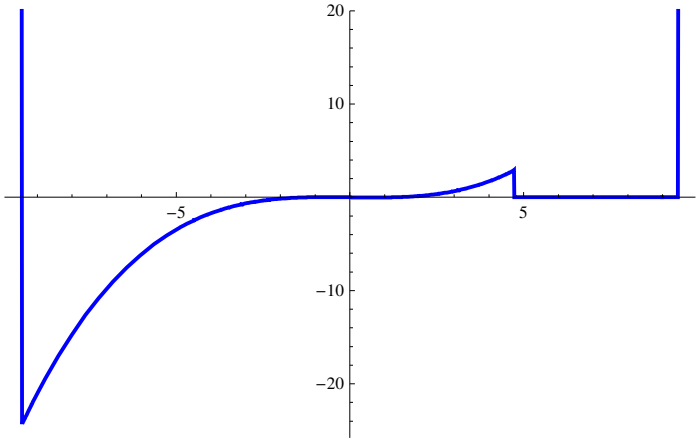
```
(* z12 *)
(*  U(x) = V0*v(x); V0 = 25 eV, L = 3 Å; *)
L = 3. / clength;
A = -L; B = +L;
V0 = 25. / cenergy;
U[x_Real] := If[Abs[x] < L, V0 * (BesselJ[2, x]), W];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {-1.1, 2.9}]
```



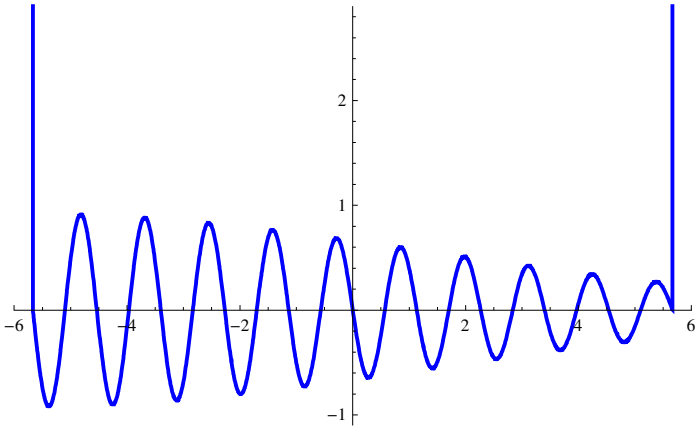

```
(* z13 *)
(*  U(x) = V0*v(x); V0 = 25 eV, L = 3 Å; *)
L = 3. / clength;
A = -L; B = +L;
V0 = 25. / cenergy;
(* ₁F₁(1;2;x)=> Hypergeometric1F1[1,2,x] *)
U[x_Real] := If[x > -L && x < L / 4, V0 * (Hypergeometric1F1[1, 2, x]),
    If[x ≥ L / 4 && x < L, 0., W]];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {-1.1, 2.9}]
```



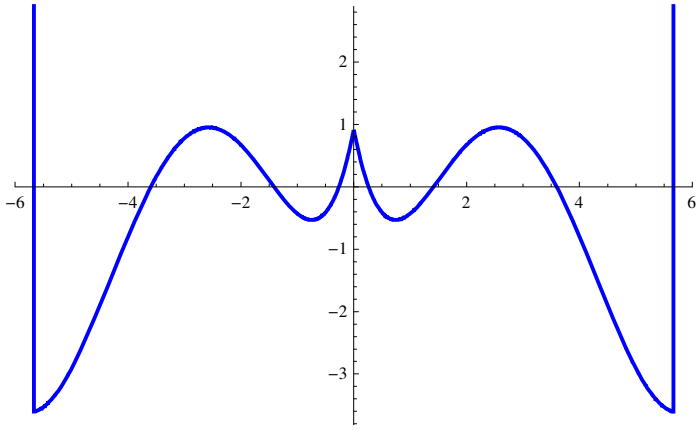
```
(* Hermite polynomial Hn(x)=> HermiteH[n,x] *)
(* z14 *)
(*  U(x) = V0*v(x); V0 = 0.1 eV, L = 5 Å; *)
L = 5. / clength;
A = -L; B = +L;
V0 = 0.1 / cenergy;
W = 20;
(* Hermite polynomial Hn(x)=> HermiteH[n,x] *)
U[x_Real] := If[x > -L && x < L / 2, V0 * (HermiteH[3, x]),
   If[x ≥ L / 2 && x < L, 0., W]];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]},
 PlotRange → {All, W - 0.01}]
```



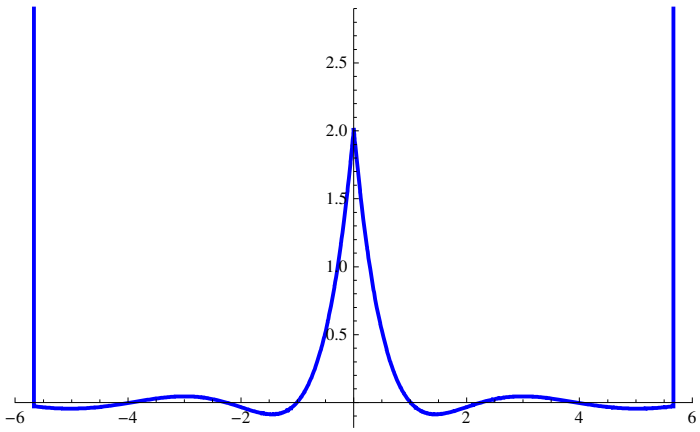

```
(* z15 *)
(*  U(x) = V0*v(x); V0 = 15 eV, L = 5 Å; *)
L = 3. / clength;
A = -L; B = +L;
V0 = 25. / cenergy;
U[x_Real] :=
  If[Abs[x] < L, V0 * (-Sin[π * x / (0.1 * L)] * Exp[-((x + L) / 10)^2]), W];
Plot[U[z], {z, A - 0.1, B + 0.1}, PlotStyle →
  {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {-1.1, 2.9}]
```



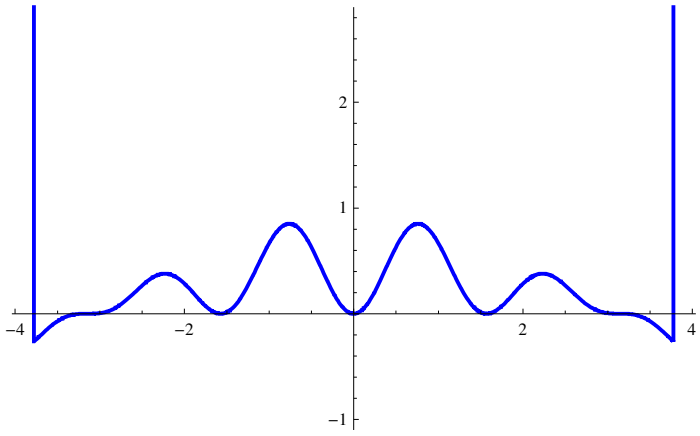
```
(* z16 *)
(*  U(x) = V0*v(x); V0 = 25 eV, L = 3 Å; *)
L = 3. / clength;
A = -L; B = +L;
V0 = 25. / cenergy;
(* Laguerre polynomial Ln(x) => LaguerreL[n,x] *)
U[x_Real] := If[Abs[x] < L, V0 * (LaguerreL[5, Abs[x]]), W];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {All, 2.9}]
```



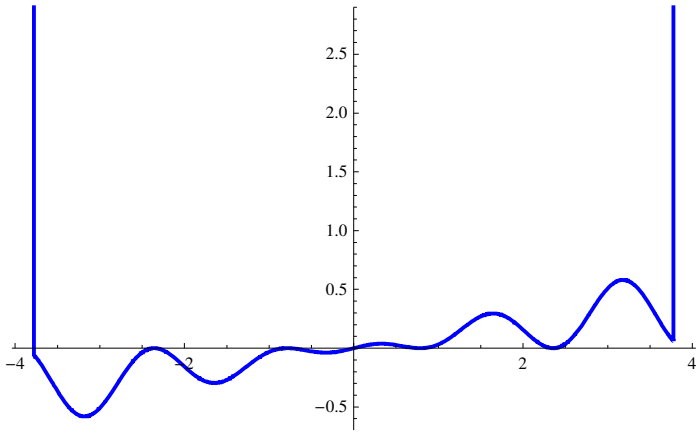

```
(* z17 *)
(*  U(x) = V0*v(x); V0 = 25 eV, L = 3 Å; *)
L = 3. / clength;
A = -L; B = +L;
V0 = 0.1 / cenergy;
a = 3.5;
(* Generalized Laguerre polynomialLn^a(x) => LaguerreL[n,a,x] *)
U[x_Real] := If[Abs[x] < L, V0 * (LaguerreL[10, a, Abs[x]]), W];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {All, 2.9}]
```



```
(* z18 *)
(*  U(x) = V0*v(x); V0 = 25 eV, L = 2 Å; *)
L = 2. / clength;
A = -L; B = +L;
V0 = 25. / cenergy;
U[x_Real] := If[Abs[x] < L, V0 * ((Sin[2 * x] ^ 2) * Cos[x / 2]), W];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {-1.1, 2.9}]
```




```
(* z19 *)
(*  U(x) = V0*v(x); V0 = 25 eV, L = 2 Å; *)
L = 2. / clength;
A = -L; B = +L;
V0 = 25. / cenergy;
(* Whittaker function M_{k,m}(z) => WhittakerM[k,m,z] *)
U[x_Real] := If[Abs[x] < L, V0 * ((Cos[2 * x] ^ 2) * (x / 5)), W];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {All, 2.9}]
```



```
(* z20 *)
(*  U(x) = V0*v(x); V0 = 25 eV, L = 2 Å; *)
L = 2. / clength;
A = -L; B = +L;
V0 = 15. / cenergy;
(* Whittaker function M_{k,m}(z) => WhittakerM[k,m,z] *)
U[x_Real] := If[Abs[x] < L, V0 * ((x - L / 3) ^2) * Exp[-x^2], W];
Plot[U[z], {z, A - 0.1, B + 0.1},
 PlotStyle → {AbsoluteThickness[2], RGBColor[0, 0, 1]}, PlotRange → {All, 2.9}]
```