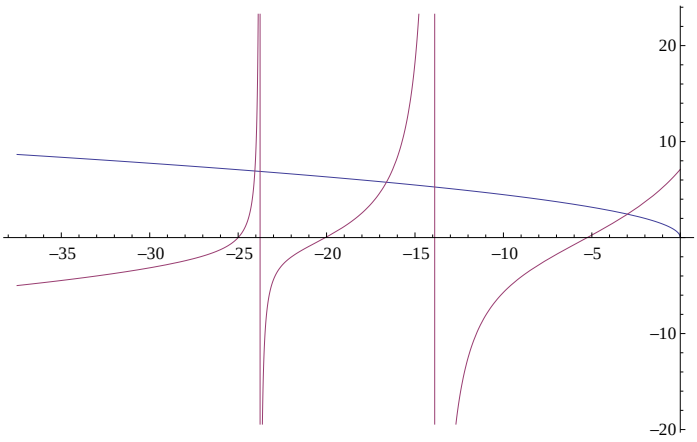
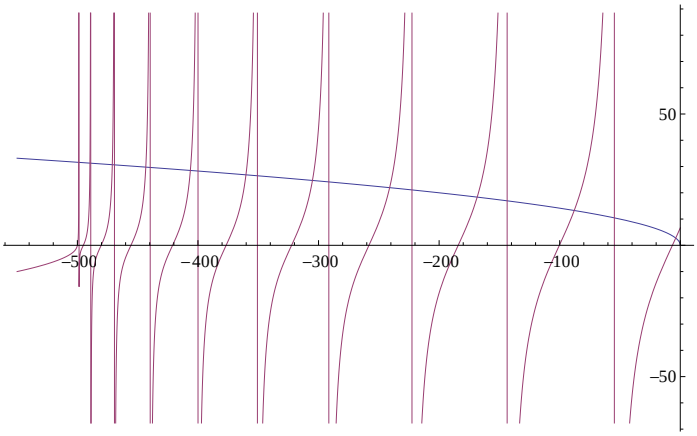
Solution to equation $\kappa = l\tan(la)$ for $V_0 = 25$ for even-parity solution. Note that there are only three solutions for this choice of V_0.

```
hbar = 1; V0 = 25.0; m = 1; a = 1.0;
l[ee_] := Sqrt[2 m (ee + V0)] / hbar;
k[ee_] := Sqrt[-2 m ee] / hbar;
fl[ee_] := l[ee] * Tan[a * l[ee]];
Plot[{k[ee], fl[ee]}, {ee, 0, -1.5 V0}]
```




```
hbar = 1; V0 = 500.0; m = 1; a = 1.0;
l[ee_] := Sqrt[2 m (ee + V0)] / hbar;
k[ee_] := Sqrt[-2 m ee] / hbar;
fl[ee_] := l[ee] * Tan[a * l[ee]];
Plot[{k[ee], fl[ee]}, {ee, 0, -1.1 V0}]
```

Solution to equation $\kappa = l\tan(la)$ for $V_0 = 500$ for even-parity solution. Note that there are 11 solutions for this choice of V_0.



Solution to tan z = Sqrt[(z0/z)^2-1] for V0=500,50,5. Note that as V0->0, there is only one solution left. It is located in the range of $0<z<\pi/2$. As z -> Infinity, the roots tend to occur near to the values of $n\pi/2$.

In[5]:=
```
hbar = 1; m = 1; a = 1.0;
z0 = (a / hbar) Sqrt[2 m V0];
f2[z_] := Sqrt[(z0 / z)^2 - 1];
Plot[{f2[z] /. {V0 → 500}, f2[z] /. {V0 → 50}, f2[z] /. {V0 → 1}, Tan[z]},
 {z, 0, 10 Pi}, PlotStyle → {Red, Blue, Green, Black},
 PlotLabel → {"Red:V0=500;Blue:V0=50;Green:V0=1"}, AxesLabel → {"z", ""}]
```

{Red:V0=500;Blue:V0=50;Green:V0=1}

Out[8]=