In[1]:=
```
R = 8.3145 (* in J mol^-1 K^-1 *)
```

Out[1]= 8.3145

In[2]:=
```
P_pure[Tbp_, ΔH_, T_] := Exp[-ΔH/R (1/T - 1/Tbp)]
```

In[3]:=
```
P_total[T_, XA_] := XA (P_pure[T_bpA, ΔH_A, T]) + (1 - XA) (P_pure[T_bpB, ΔH_B, T])
```

In[4]:=

In[5]:=
```
T_bpA = 353.25 (* boiling point of benzene *)
```

Out[5]= 353.25

In[6]:=
```
T_bpB = 383.78 (* boiling point of toluene *)
```

Out[6]= 383.78

In[7]:=
```
ΔH_A = 30820 (* entalpy of vaporization benzene J mol^-1 *)
```

Out[7]= 30820

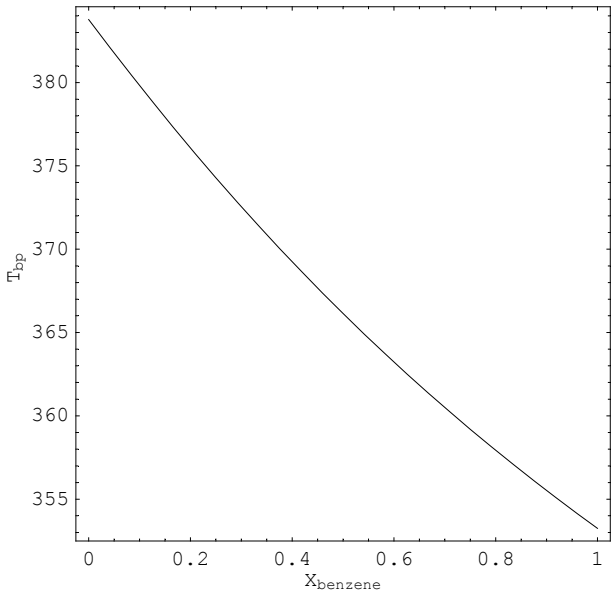
In[8]:=
```
ΔH_B = 39200 (* entalpy of vaporization toluene J mol^-1 *)
```

Out[8]= 39200

In[9]:=
```
T /. FindRoot[P_total[T, 0] - 1 == 0, {T, 390}]
```

Out[9]= 383.78

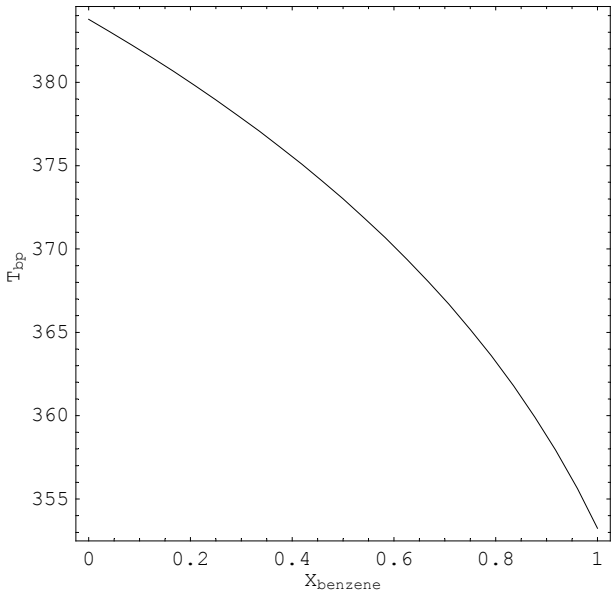
In[10]:=
```
TvXAliquid = Plot[(T /. FindRoot [P_total[T, XA] - 1 == 0, {T, 390}]),
  {XA, 0, 1}, {AxesOrigin → {0, T_bpA }, PlotRegion → {{0, 1}, {0, 1}},
   AspectRatio → 1, Frame → True, FrameLabel → {"X_benzene", " T_bp"}}]
```



Out[10]= - Graphics -

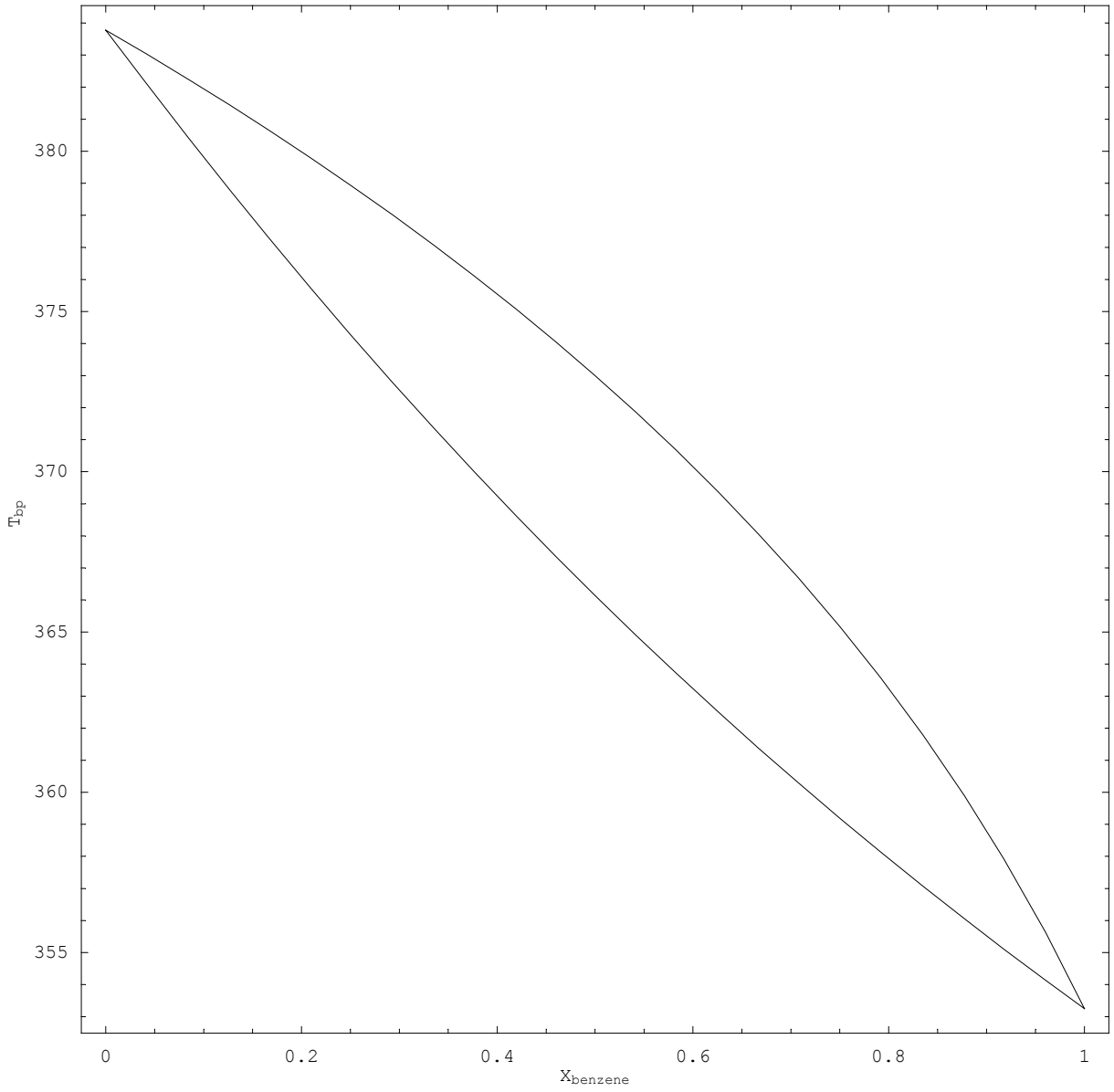
In[11]:=

In[12]:=
```
TvXAvapor = Plot[(T /. FindRoot [P_total[T, XAvapor / P_pure[T_bpA, ΔH_A, T]] - 1 == 0, {T, 390}]),
  {XAvapor, 0, 1}, {AxesOrigin → {0, T_bpA }, PlotRegion → {{0, 1}, {0, 1}},
   AspectRatio → 1, Frame → True, FrameLabel → {"X_benzene", " T_bp"}}]
```



Out[12]= - Graphics -

In[13]:= **Show[TvXAliquid, TvXAvapor]**



Out[13]= **-** Graphics **-**