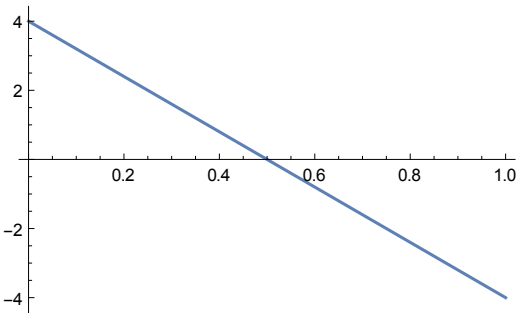
Calculation of the Lyapunov exponent for the Logistic Map at r = 4 using the analytically derived natural densitiy.

In[40]:=
```
f[x_] := 4 x (1 - x)
```

In[56]:=
```
df[x_] := f'[x]
Plot[df[x], {x, 0, 1}]
```

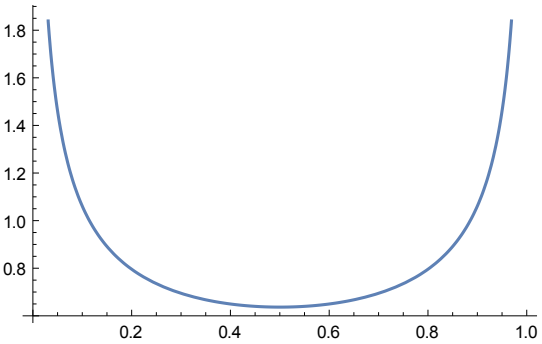
Out[57]=



In[9]:=
```
rho[x_] := 1 / (Pi * Sqrt[x (1 - x)])
```

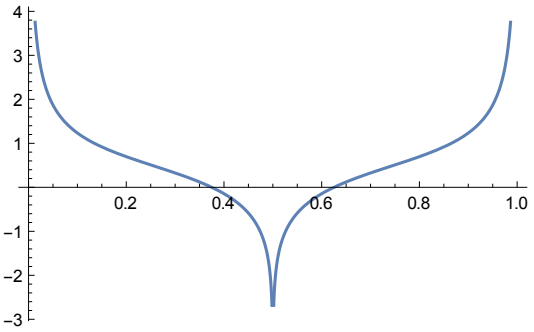
In[53]:=
```
Plot[rho[x], {x, 0, 1}]
```

Out[53]=



In[58]:=
```
integrand[x_] := Log[Abs[df[x]]] * rho[x]
Plot[integrand[x], {x, 0, 1}]
```

Out[59]=



In[60]:=
```
Integrate[integrand[x], {x, 0, 1}]
```

Out[60]= $\text{Log}[2]$