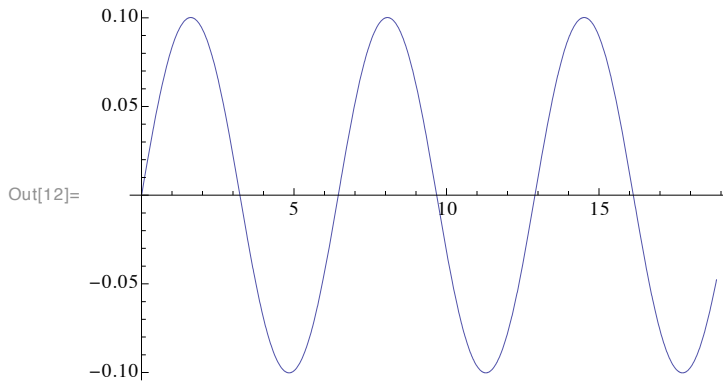


(\*The complete solution to the pendulum angle phi[t] can be written\*)

```
In[4]:= phi[u_, k_] := ArcSin[k*JacobiSN[u, k]]
```

(\*Here u is dimensionless time and  $k = \text{Sin}[\alpha/2]$  is the initial condition. That is  $\alpha$  is the angle phi at time  $t = 0$ . For very small starting angle  $k=0.1$  we should get sinusoidal behavior consistent with the small angel approximation  $\alpha \ll 1$ \*)

```
In[12]:= Plot[phi[u, 0.1], {u, 0, 6*Pi}]
```



```
In[7]:= (*As we increase alpha or equivalently k we see the hang time around phi = +/-alpha:*)
```

```
In[15]:= Plot[phi[u, .9], {u, 0, 6*Pi}]
```

