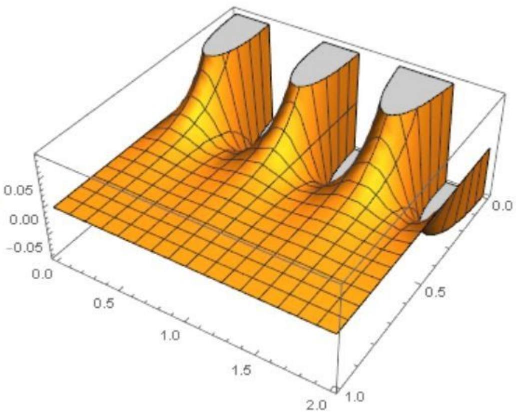
Plots for Book Problems.

```
In[34]:= Clear[V0, a, b, m, V]
a = 1;
b = 2;
V0 = 3;
m = 50;

V[x_, y_, N_] := V0 * (8 / Pi) * Sum[(1 / (4 * n + 2)) * Exp[- (4 * n + 2) * (Pi / 2) * x] * Sin[(4 * n + 2) * (Pi / 2) * y], {n, 1, N}];
Plot3D[V[x, y, m], {x, 0, a}, {y, 0, b}]
```

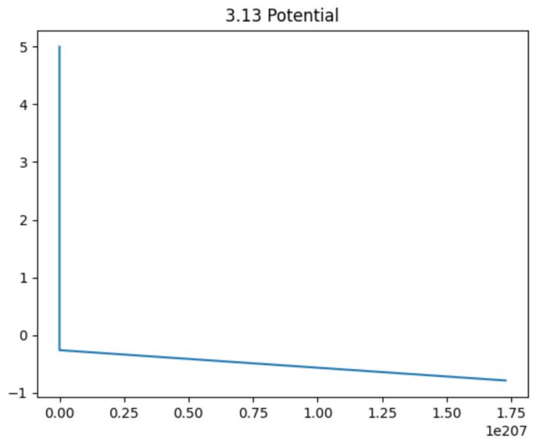
Out[40]=

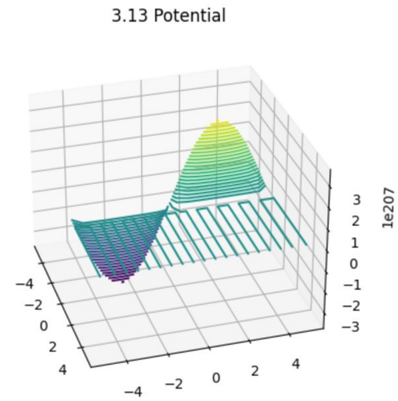


The function being graphed above is the following:

$$\boxed{V(x,y) = \sum_{n=1}^{\infty} \frac{8V_0}{(4n-2)\pi} e^{-\frac{(4n-2)\pi x}{a}} \sin\left(\frac{(4n-2)\pi y}{a}\right)}$$

I tried graphing this is Python, but couldn't seem to get it to work. However, the graph does look similar to what I was supposed to get.






```python
import numpy as np
import matplotlib.pyplot as plt

x = np.linspace(-5,5,20)
y = np.linspace(-5,5,20)

X, Y = np.meshgrid(x,y)
dx = 1
a = 1
b = 2
vo = 3

def potential(x,y):
    sum = 0
    for n in np.arange(0,50,dx):
        sum += (8*vo)/((4*n-2)*np.pi)*np.exp((-(4*n-2)*np.pi*x)/a)*np.sin(((4*n-2)*np.pi*y)/a)
    return sum

Z = potential(X,Y)

plt.figure()
ax = plt.axes(projection='3d')
plt.title("3.13 Potential")
plt.contour(X,Y,Z,50)

plt.figure()
plt.title("3.13 Potential")
plt.plot(potential(x,y),y)
plt.show()

```

I'm only showing this because I feel dirty using mathematica -- it's like driving a manual or using a chainsaw, you just feel better using the analog. Plus mathematica is basically a calculator with extra complication.

```
In[41]:=
Clear[V0, a, b, m, V]

a = 1;
b = 2;
V0 = 3;
m = 50;

V[x_, y_, N_] = Sum[(4/Pi*n)*V0/Sinh[(Pi*n/a)*b]*Sinh[(Pi*n/a)*x]*Sin[(Pi*n/a)*y], {n, 1, N}];
Plot3D[V[x, y, m], {x, 0, a}, {y, 0, b}]
```

Out[ ]= 3

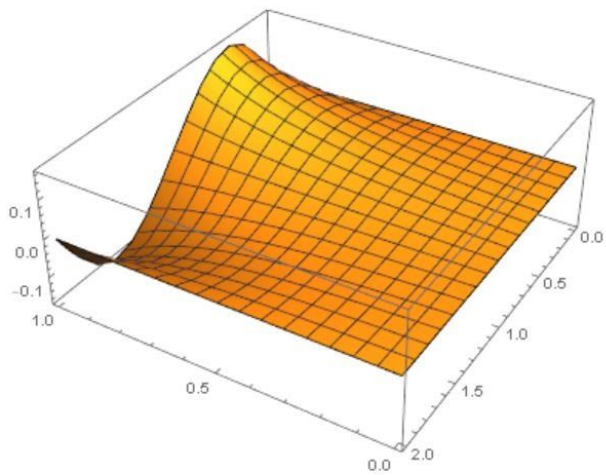
Out[ ]= 1

Out[ ]= 2

Out[ ]= 50

Out[ ]= $\sum_{n=1}^{N} \frac{12\, n\, \mathrm{Csch}[2 n \pi]\, \mathrm{Sin}[n \pi y]\, \mathrm{Sinh}[n \pi x]}{\pi}$

Out[ ]=



The function being graphed above is the following:

$$\boxed{V(x,y) = \frac{4V_0}{\pi} \sum_{n=1,3,5,\ldots} \frac{\sinh\left(\frac{n\pi x}{a}\right) \sin\left(\frac{n\pi y}{a}\right)}{n \sinh\left(\frac{n\pi b}{a}\right)}}$$