```python
#!/usr/bin/python
__author__="morganlnance"
__question__="hw1_q7"


from math import log
from numpy import arange
import matplotlib.pyplot as plt


def hill( m, n, pH ):
    """
    Use the modified Hill equation ( m = 1 ) to calculate X
    :param m: float()
    :param n: float()
    :param pH: float( pH )
    :return float
    """
    # the 6 is actually pKa which we are setting to 6 for this
question
    X = float(m) * ( (10**(float(n)*(pH - 6))) / (1 +
(10**(float(n)*(pH - 6 )))) )

    return X


# pH 0 through 10
pH_vals = arange( 0, 10.1, 0.1 )

# m = 1, n = 1, n = 0.75, n = 1.25
plt.plot( pH_vals, [ hill( m=1, n=1, pH=x ) for x in pH_vals ], 'b',
label="m=1 n=1" )
plt.plot( pH_vals, [ hill( m=1, n=0.75, pH=x ) for x in pH_vals ],
'r', label="m=1 n=0.75" )
plt.plot( pH_vals, [ hill( m=1, n=1.25, pH=x ) for x in pH_vals ],
'g', label="m=1 n=1.25" )

# n = 1, m = 1, m = 2, m = 3
plt.plot( pH_vals, [ hill( m=1, n=1, pH=x ) for x in pH_vals ], 'b',
label="m=1 n=1" )
plt.plot( pH_vals, [ hill( m=2, n=1, pH=x ) for x in pH_vals ], '--r',
label="m=2 n=1" )
plt.plot( pH_vals, [ hill( m=3, n=1, pH=x ) for x in pH_vals ], '--g',
label="m=3 n=1" )
```