Homework #2, Problem 27

Assume \( p \propto d^n \rightarrow p = c \cdot d^n \)

Take \( \ln \) each side \( \ln p = \ln c + n \ln d \)

(\( \ln(ab) = \ln a + \ln b \) and \( \ln(a^b) = b \cdot \ln a \))

\( \ln p = \ln c + n \ln d \) is like

\( y = b + m \cdot x \) a line

with slope \( m \) and \( y \) intercept \( b \)

so \( \ln p = y \)

\( \ln d = x \)

then \( n = m \)

and \( \ln c = b \rightarrow e^{\ln c} = e^b \)

\( c = e^b \)

So for Jupiter and Neptune,

plot \( \ln d \) as an \( x \) coordinate

plot \( \ln p \) as a \( y \) coordinate

do for Jupiter and do for Neptune

Have a line (i.e. two points defining a line)

Find slope of line \( m \) is \( n \)

Find \( y \) intercept \( b \) then \( c = e^b \)

\( p = c \cdot d^n \)

Note: To obtain WebWork desired solution, \( d \) is in units of \( 1 \times 10^6 \) km,

and \( p \) is in units of days