- Notes: Prior to class, instructor will need to obtain a set of power supplies with current measurement from tech support as well as a set of 50 ohm ¼ W resistors and a set of 50 ohm larger resistors as well.

- You will also need a modified SunROM board with interchangeable crystals

Ohms Law and Power

Lecture Objectives:

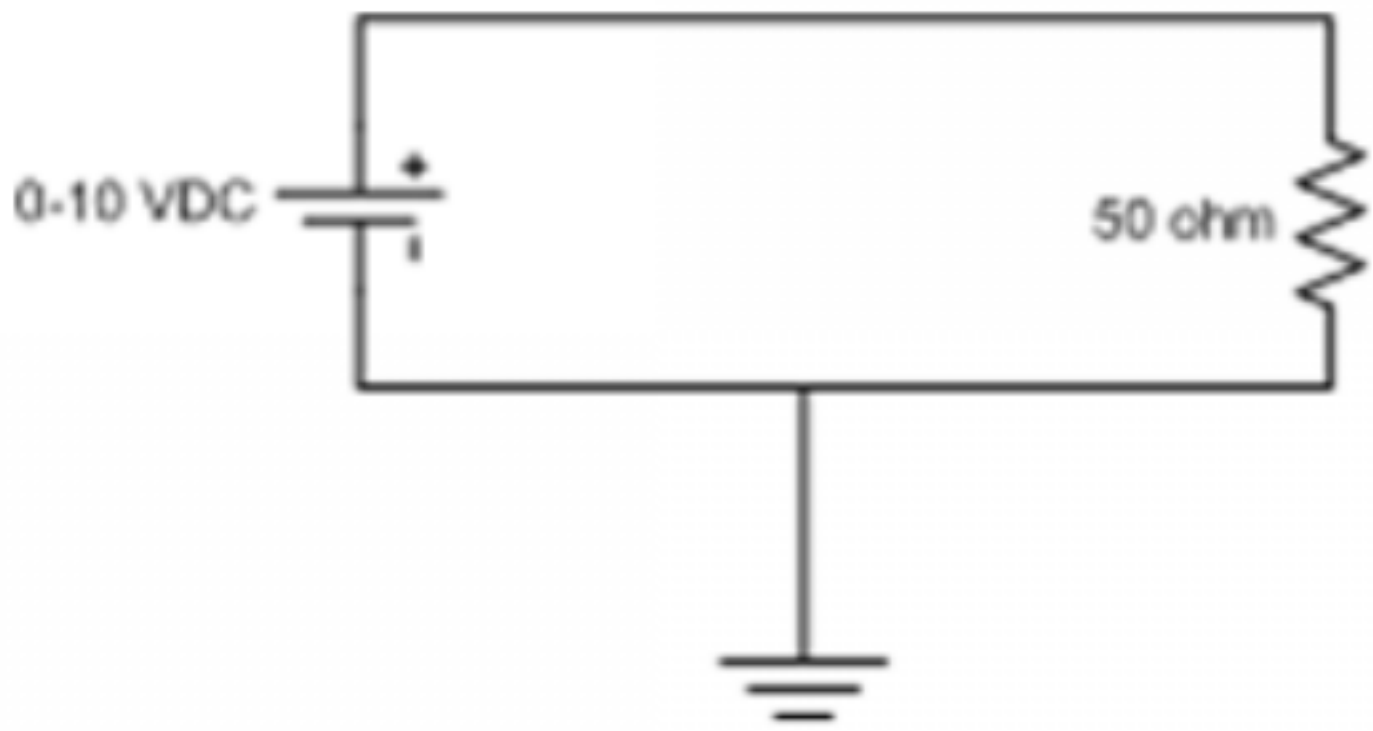
1) Explain the relationship between current, voltage, and resistance (Ohms Law)
2) Calculate the power dissipated in a resistor based on voltage and current
3) Explain the relationship between clock rate and dissipated power.

Homework

- Handout sheet

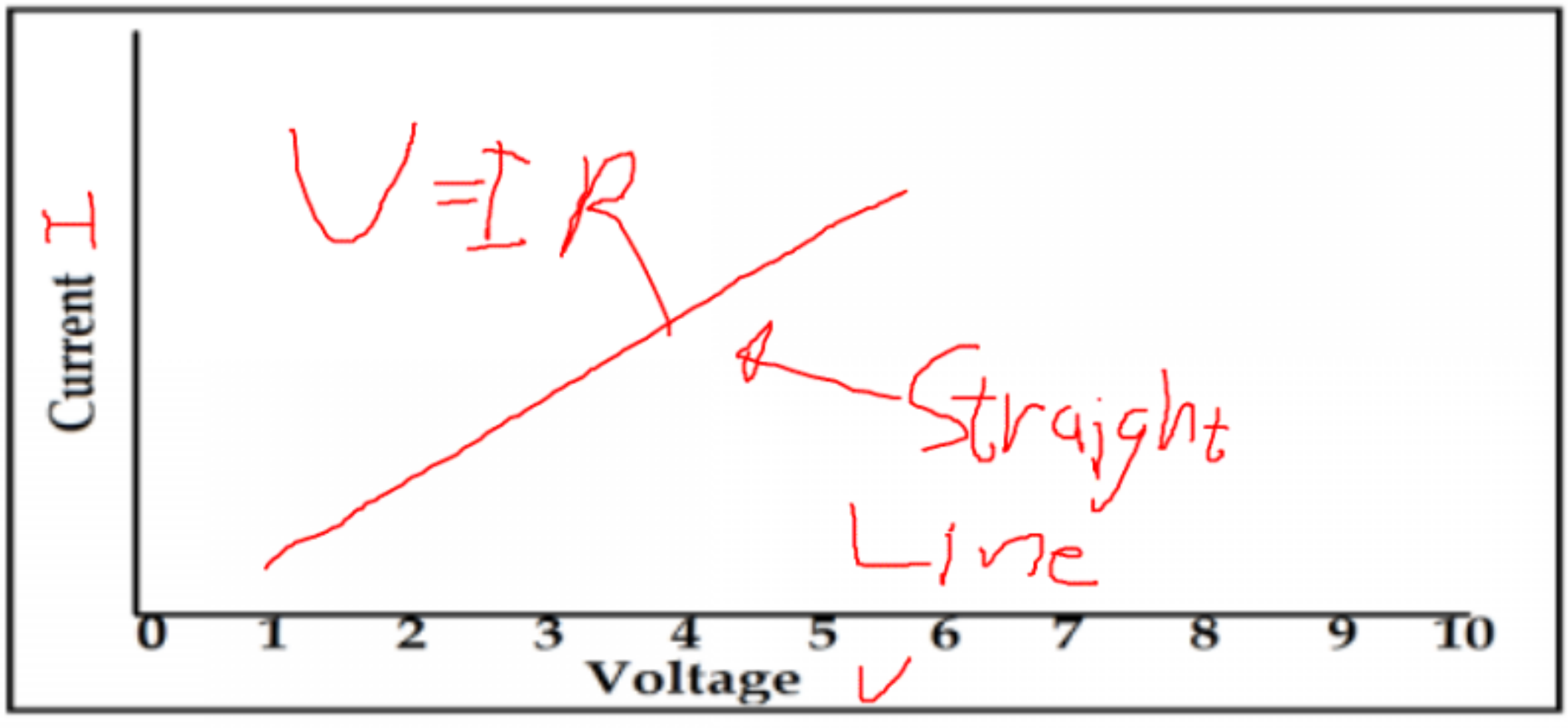
In Class Activity

- Your instructor will pas out a power supply and a resistor
  - Wire the following circuit (Your instructor will aid you)
  - Starting at 0 V, measure the current as you increase the voltage between 0 and 10 V.
  - Plot the results



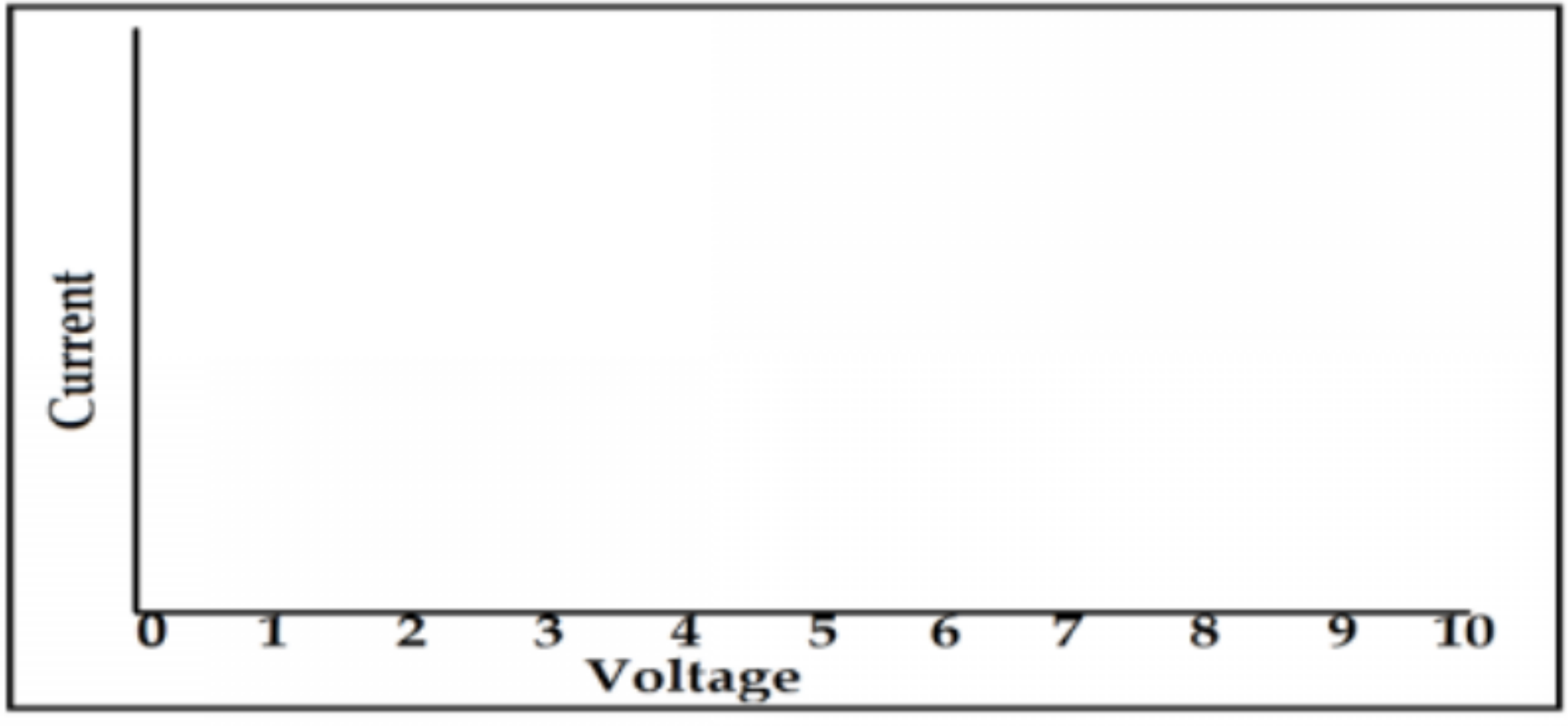
In class activity

Voltage	Current	Voltage	Current
.5 V		4V	
1V		5V	
1.5V		6V	
2V		7V	
2.5V		8V	
3V		9V	
3.5V		10V	



In class activity

Voltage	Current	Voltage	Current
.5 V		4V	
1V		5V	
1.5V		6V	
2V		7V	
2.5V		8V	
3V		9V	
3.5V		10V	



Ohm's Law

$$V = I \times R$$

V=> Voltage
I=> Current
R=> Resistance

Power

$$W = V \times I$$

$$W = V^2 / R$$

Nonlinear relationship

W=> Power (Watts)

V=> Voltage

I=> Current

R=> Resistance

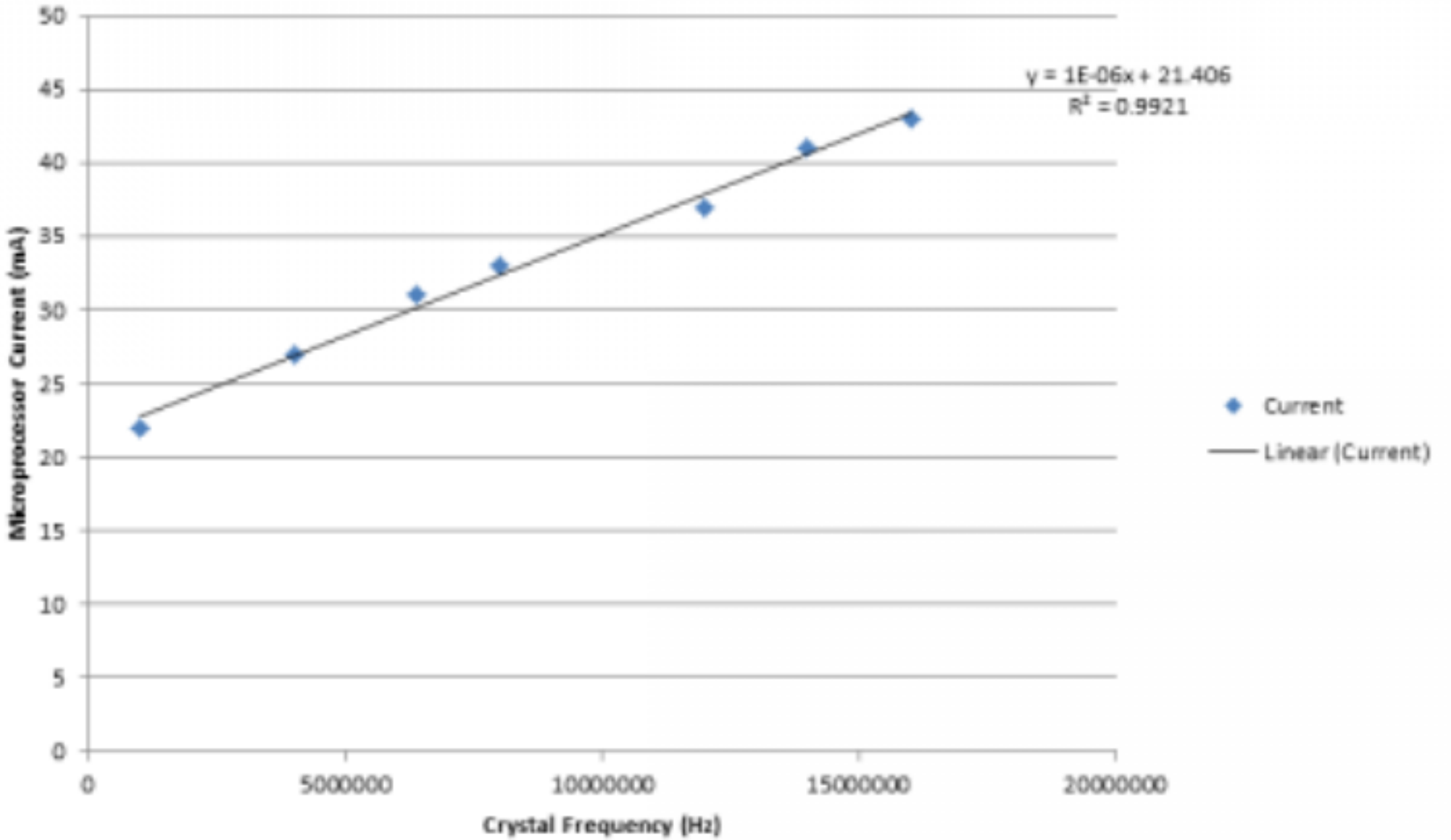
What is power

- Power is the energy used by an electronic device to do work
  - For computers, it's byproduct is heat.

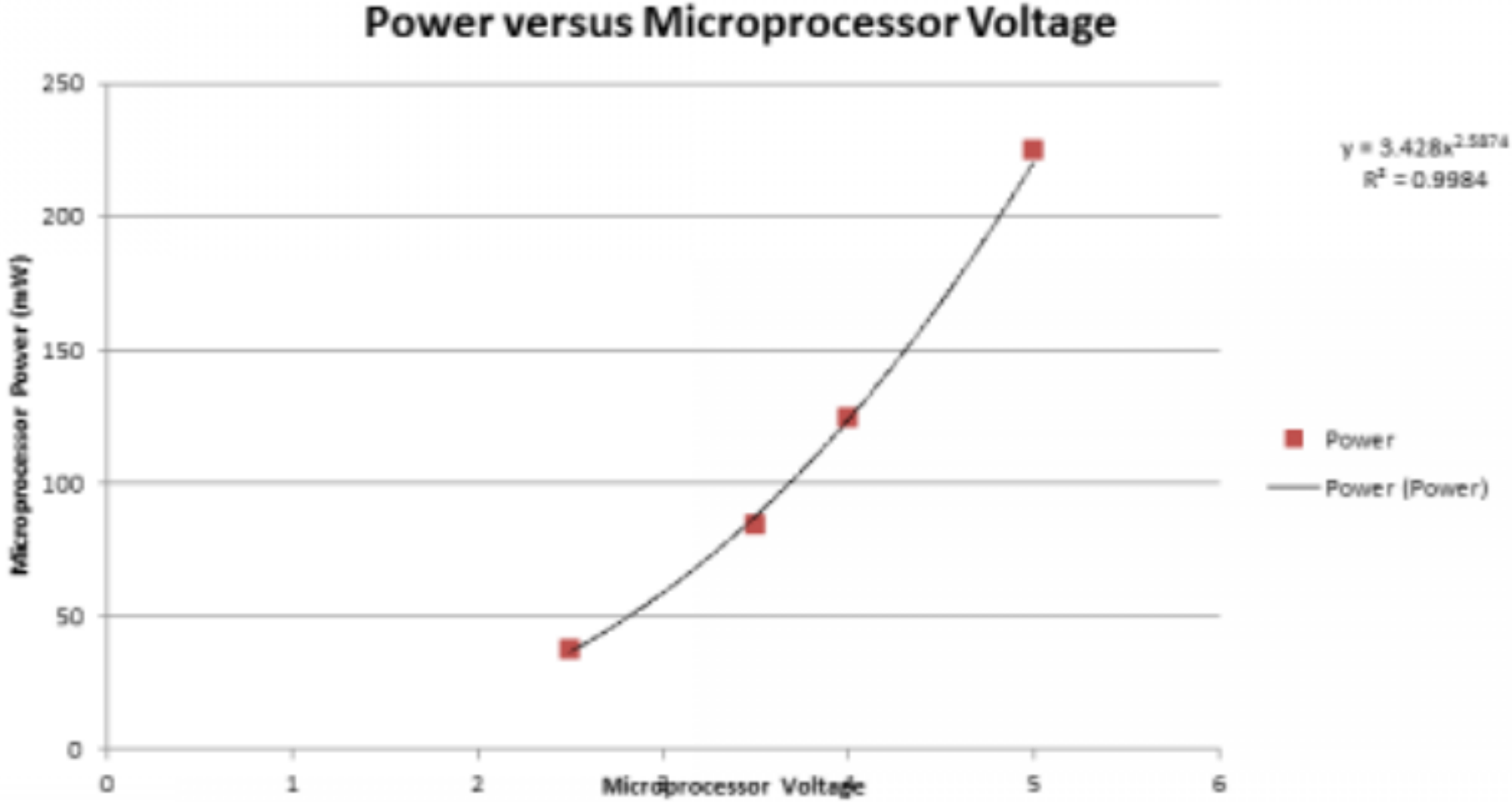
Demo part 2

- Using a modified SunROM board, measure the power used to run the board at 1Mhz, 4 Mhz, and 16 MhZ.
- Sample code for the program is available.

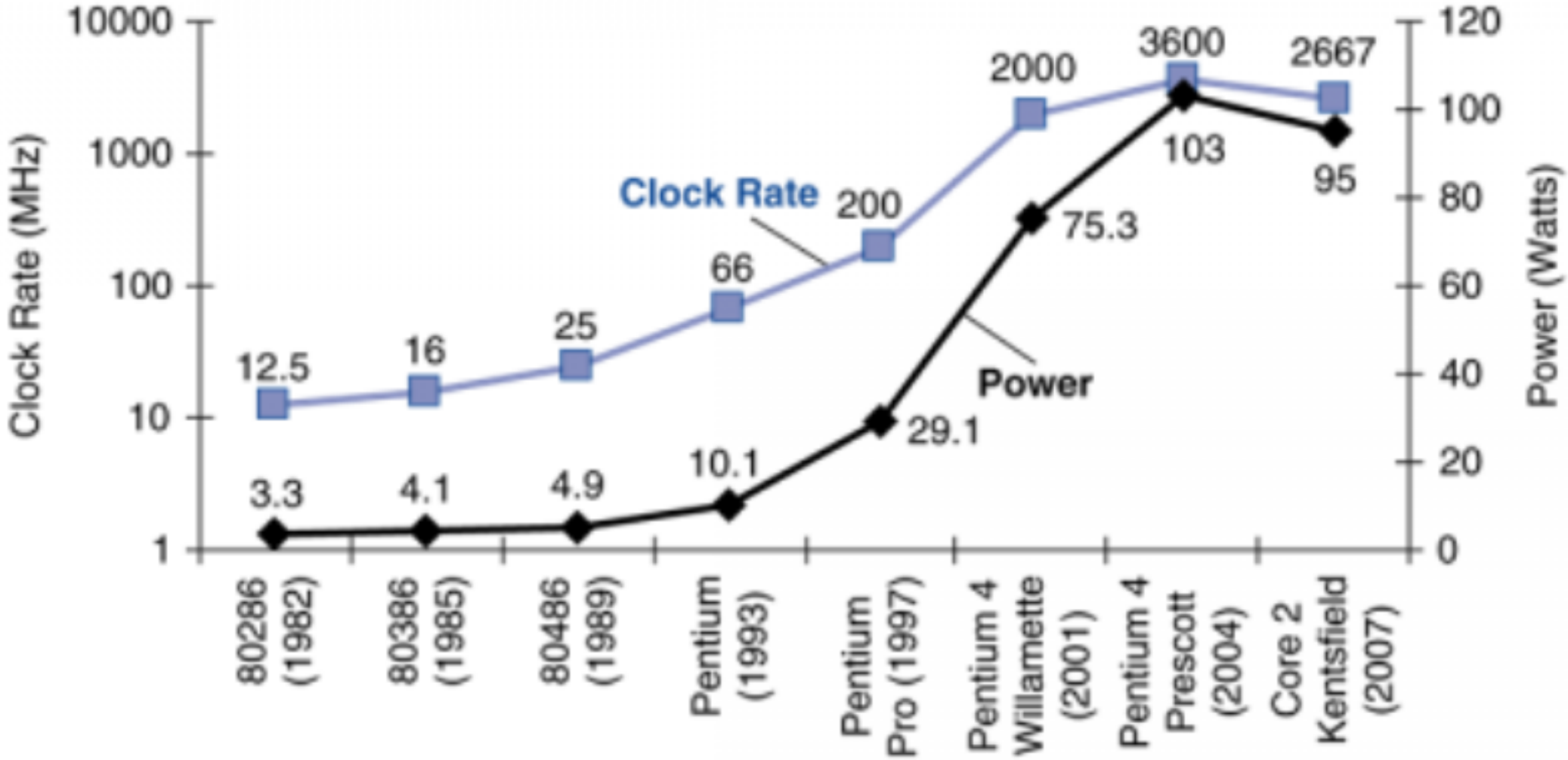
Instructor's Data
(11/14/2012)



Instructor's Data (11/14/2012)



Power and computers



Power Calculation

$$Power = CapacitiveLoad \times Voltage^2 \times ClockFrequency$$

- What will cause power to go up?

Why do you care?

- Overclocking
  - Setting your CPU and memory to run at speeds higher than their official speed grade.
  - Intel Core i7 860
    - 2.80GHz out of the box.
    - Overclocked if pushed to a clock speed higher than 2.80GHz

↑ heat

↑ Power