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Due date: Fri Jan 27 03:00:00 pm 2017 (CST)

Register your i>clicker at Illinois COMPASS2g.

1. A I answered B I didn't do
it. it.

Tries 0/99

This homework is a review on units, conversions etc. See the discussion and table at Wikipedia. In this ECE class you will need to do various computations. Many include mastering of conversions. You must do these without using your calculator!

Convert the following quantities as requested (no computation required):

(a) 10 cg = g (grams); In (scientific) exponential notation, this is 1e g

(b) 0.1 ms = s (seconds); In (scientific) exponential notation, this is 1e s

Tries 0/99

(c) 100 W = mW (milliWatts); In (scientific) exponential notation, this is 1e mW

(d) 10 cm² = m² (square meters); In (scientific) exponential notation, this is 1e m²

Tries 0/99

Convert the following quantities as requested (some mental computation required; Hint: 1 mile = 1.609 km):

(e) You are running at a speed of 5 miles per 50 minutes.

In one minute you have run a distance of miles = meters.

Tries 0/99

Compute the following quantities as requested:

(f) A wheel is rotating at a speed of 6 turns per second.

One complete turn of the wheel will take ms (milliseconds).

(g) Ohm's law states that for a resistor, the resistance value is equal to the amount of voltage across the resistor divided by the current through the resistor ($R=V/I$). The units are Ohms (for R), volts (for V), and amps(for I).

$R = (17 \text{ volts})/(4\text{milliamps}) = \text{input} \text{ kiloOhms}$

Tries 0/99

In the ECE 110 Lab, you will make use of equipment that is capable of producing measurements accurate up to several decimal places. Subsequently your records of these measurements should reflect this level of precision. Here we have listed the most basic rules regarding significant figures. This list is intended to be a very brief review of significant figures; if this is your first time dealing with them, please take some time review the concept on your own.

Reference: Course Notes

The significant figures (or digits) of a number are any digits except:

1. All leading zeros.
 - 0.0001 has only one significant figure
 - 0.00040 has two significant figures

2. All trailing zeros that are used as placeholders to indicate the order of magnitude of the number.
 - If the trailing zeros on your measurement are significant, use scientific notation to indicate which digits are significant.
 - 1000 has only one significant digit but 1.00×10^3 has three
 - 1200 has two significant figures

3. Digits that were introduced by calculation.
 - The results of your computations should indicate the same level of precision as your least precise measurement
 - For example: $(0.52)(0.10)=0.052$ but $(0.52)(0.1)=0.05$

Now that we've refreshed on the basics of significant figures, let's practice using them.

How many significant digits will the result of each calculation have? ($1e-10 = 1 \text{ times } 10^{-10}$)

Choices: **1, 2, 3, 4, 5, 6.**

- 2.1 e-10 Ohms
- 1570 mV
- 6 V
- 0.00157 kV
- 1.570 V

How many significant digits will the result of each calculation have? (* means multiplication)

Choices: **1, 2, 3, 4, 5, 6.**

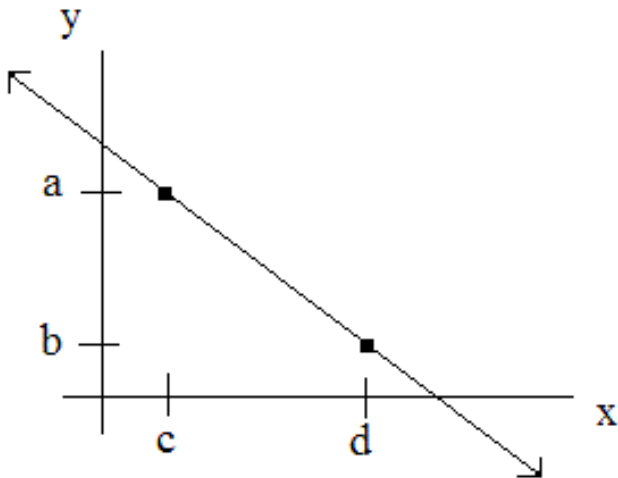
- $0.3240 \cdot 12.9$
- $8.156 - 5.610 \times 10^{-6}$
- $96.24 \cdot 0.0067741 \cdot 7.8002$
- $2.368 \times 10^3 \cdot 7.24 \times 10^{-2}$
- $1.0548 / 5.164972$
- $1.6340 + 6.28$

Tries 0/99

Ironically, Lon Capa was not designed to pay attention to significant digits! Instead, most problems allow for a 3% tolerance which should allow for answers to be entered to within the significant digits.

This homework is a review on linear equations and linear graphs. In this ECE class you will need to use many linear functions. Try to do these without using your calculator! You will benefit from it later in the class.

a) The graph of a line is show below (NOT necessarily drawn to scale):



- a = 17
b = 3
c = 5
d = 13

i) What is the slope of the line?

Tries 0/99

- ii) What is the y-intercept of the line?
- iii) What is the x-intercept line?

Tries 0/99

b) What is the equation of the line that goes through the points (3,-20) and (-13,-17)? (this question is independent from part (a)!)

$$y = \text{} x + \text{}$$

Tries 0/99

This homework is a review on linear equations. In this ECE class you will need to solve systems of linear equations.

Also, when providing a numerical answer, make sure to provide enough significant digits. Remember, there is some tolerance on the accuracy in LonCapa but try to be precise.

You are given a set of linear equations: $I = I_1 + I_2$ $V_1 = 5 I_1$ $V_2 = 4 I_2$ $V + V_2 = 0$ $V_1 - V_2 = 20$

An algebraic problem is solvable if there are not more variables than there are "independent" linear equations. Independence of equations is discussed in courses like Math286, Math225, and Math415. We will not dwell on it here except to say that equations we use, when found using different circuit "laws" across different circuit "paths" tend to be independent. The equations above happen to be independent.

(a) Count the number of given equations in this problem: equations

Count the number of unknowns in this problem: unknowns

Tries 0/99

(b) Use the above equations to find the linear relationship between I and V (i.e. $I = aV + b$, and you must find the coefficients a and b; use more than one substitution). This part of the exercise will reduce the problem to one equation and two unknowns.

$$I = \text{} V + \text{}$$

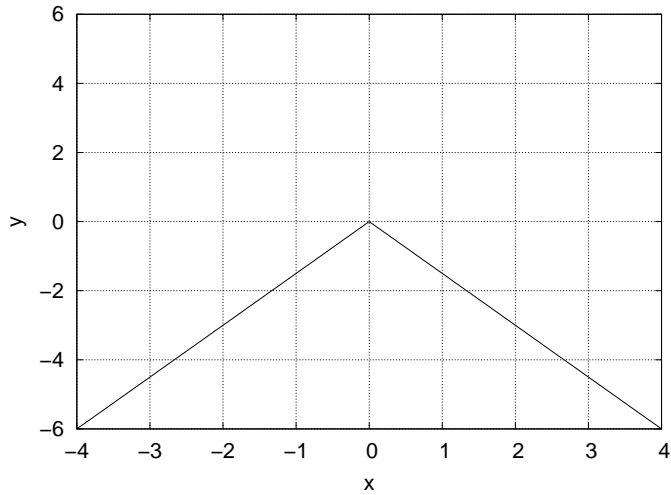
Tries 0/99

(c) If we knew that $I=0$ (one more known equation), what would be the value for V? $V = \text{}$ volts

Tries 0/99

This homework is a review on simple piecewise linear graphs. In this ECE class you will need to use various graphs associated to different function types.

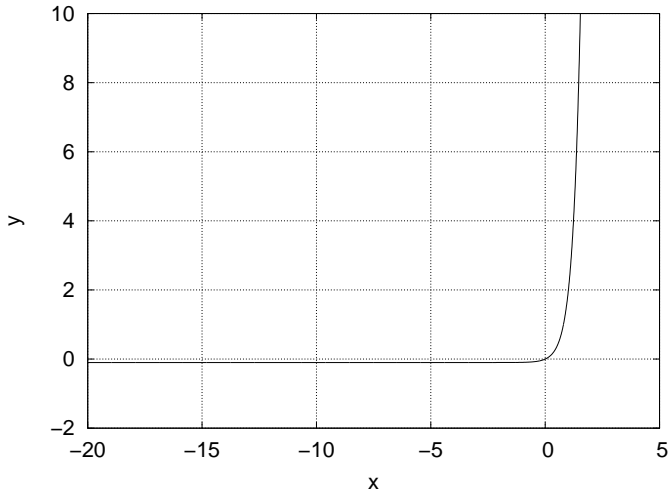
What is the correct piece-wise function represented by this graph?



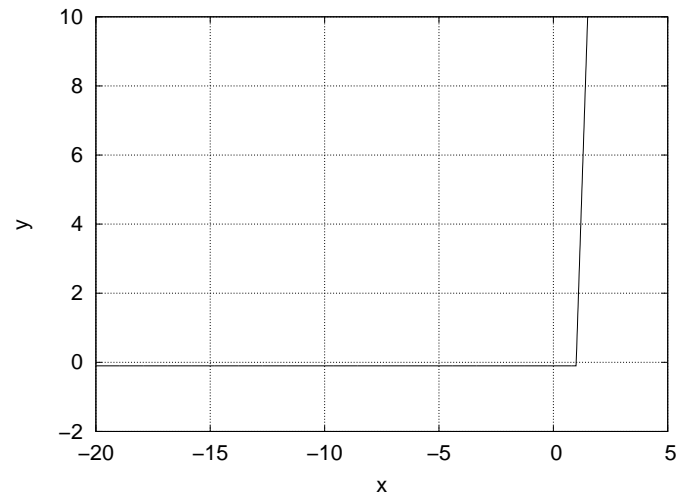
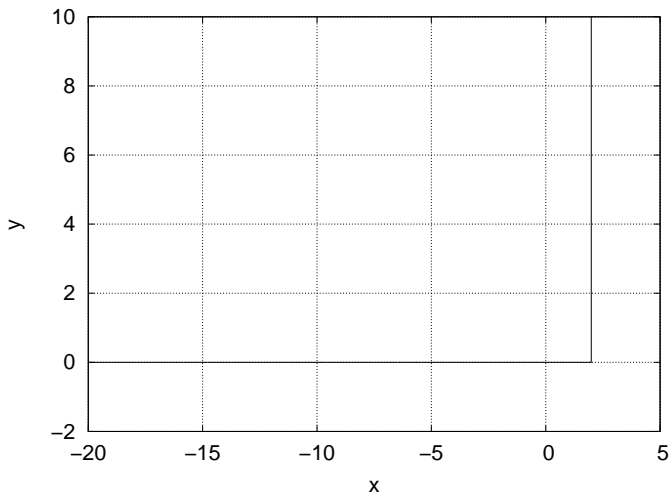
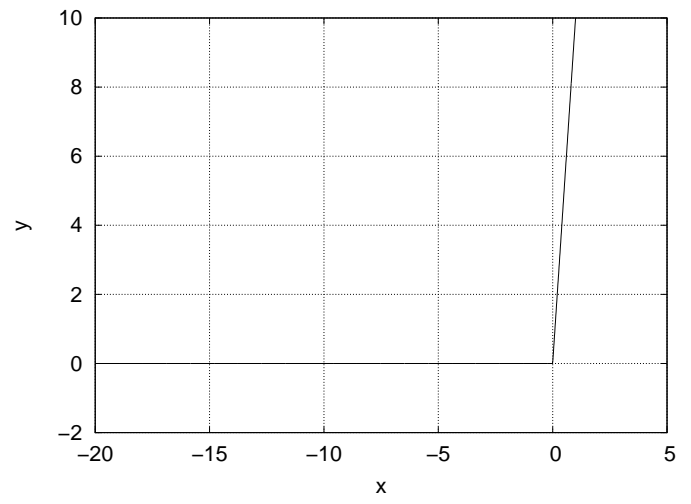
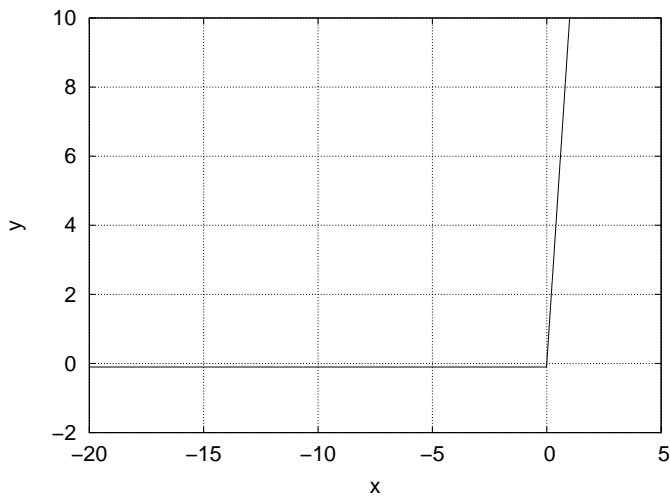
- A. $x = -1.5*y$ when $y \leq 0$; $1.5*y$ when $y > 0$
- B. $y = -1.5*x$ when $x \leq 0$; $1.5*x$ when $x > 0$
- C. $x = 1.5*y$ when $y \leq 0$; $-1.5*y$ when $y > 0$
- D. $y = 1.5*x$ when $x \leq 0$; $-1.5*x$ when $x > 0$

Tries 0/99

This homework is a review on simple piecewise non-linear graphs. In this ECE class you will need to approximate different functions with piece-wise-continuous functions.



Each plot below is a piece-wise-continuous approximation to the exponential curve above. Match each piece-wise-continuous expression to the curve it represents.



The Audio/Video equipment in each lecture room occasionally has "hickups". In preparation for the lecture, please watch this YouTube video on the Early History of ECE.

40. A I watched B I didn't
it. watch it.

Tries 0/4

This homework will aid in your ability to take accurate lab measurements. *References:*Course Notes



Click here if image is not visible (tested using FireFox)

a) What number should be recorded?

Tries 0/8



Click here if image is not visible

b) What number should be recorded?

Tries 0/8

Suppose that a constant current of **16 mA** flows in a wire. *Reference:*Course Notes

Find the absolute value of the total charge that passes through the conductor in 9 minute(s).

Charge (C) =

Tries 0/20

Suppose that a **4 nF** capacitor is charged to 150 V. *Reference:Course Notes*

What is the charge on the capacitor?

Charge (C) =

What is the energy stored in the capacitor?

Energy (J) =

Tries 0/20

Each week, you will be given one or more surveys where we can collect feedback from you. Thanks, in advance, for your help in improving the course!

Personalizing the Course!

The field of Electrical and Computer Engineering is very diverse. What do you think an Electrical or a Computer Engineer does? Is there something specific you hope to be able to do once you have completed this course (examples: Jump a car's battery or understand how a Blu-ray player works)?

Click on the hyperlink below and complete the short survey to gain credit for this problem. Return here to enter the "Lon Capa Codeword" provided in that survey. <https://illinois.edu/fb/sec/9473465>

Lon Capa Codeword:

Tries 0/4

Suppose that a **2100 kg** car is accelerated to **65 mph** in **5 s**. *Reference:Course Notes*

How much kinetic energy does the speeding auto contain?

Energy (J) =

What is the energy stored in units of kilo-calories?

Energy (kcal) =

Tries 0/4

Suppose that a **76 kg** student runs up the steps of ECEB (16 feet elevation) to visit the advising office. *Reference:Course Notes*

What is the minimum amount of energy expended by the student?

Energy (kcal) =

Tries 0/20

If a resistor of **8 kOhms** is specified to have a maximum power dissipation of **0.25 Watts**, what is the maximum current it can safely handle without damage?

(mA)

Tries 0/99

What is the power dissipated by this resistor with a **12-V** drop across it? (Watts)

Tries 0/99

What is the energy stored in a **5.1 nF** capacitor charged to **7 V**? Joules

Tries 0/99

At what voltage would a **8 μ F** capacitor have the energy to lift **8 grams** by **2 cm**?

V

Tries 0/99

A resistor of **21 kOhms** has **10 volts** applied across it. What is the value of the current through the resistor?
 amps

Tries 0/99
