MAT 105 Final Exam (gray) Summer 2011   Name _____

Problems	1	2	3	4	5	6	7	8	Total		Grade
Points										%	
Out of	40	14	28	22	38	17	22	19	200		

- Relax. You have done problems like these before. Even if these problems look a bit different, just do what you can.

- If you're not sure of something or if you're stuck, please ask!

- You may use your calculator but please show all of your work and write down as many steps as you can.

- Some formulas from our book that you might need are on a separate sheet.

- Don't spend too much time on any one problem.

- Do well. And remember to ask me if you need help.

1. Evaluate each of the following expressions.

   (a) $39.99 + 1.17(200) =$

   (b) $(14)^2 - 4(-16)(5) =$

   (c) $1,200(1.03)^{72} =$

   (d) $\dfrac{-(14)}{2(-16)} =$

   (e) $2^{60} =$

   (f) $(5.8)^{1/6} =$

   (g) $\sqrt{354} =$

   (h) $\dfrac{\log(24.33)}{\log(1.06)} =$
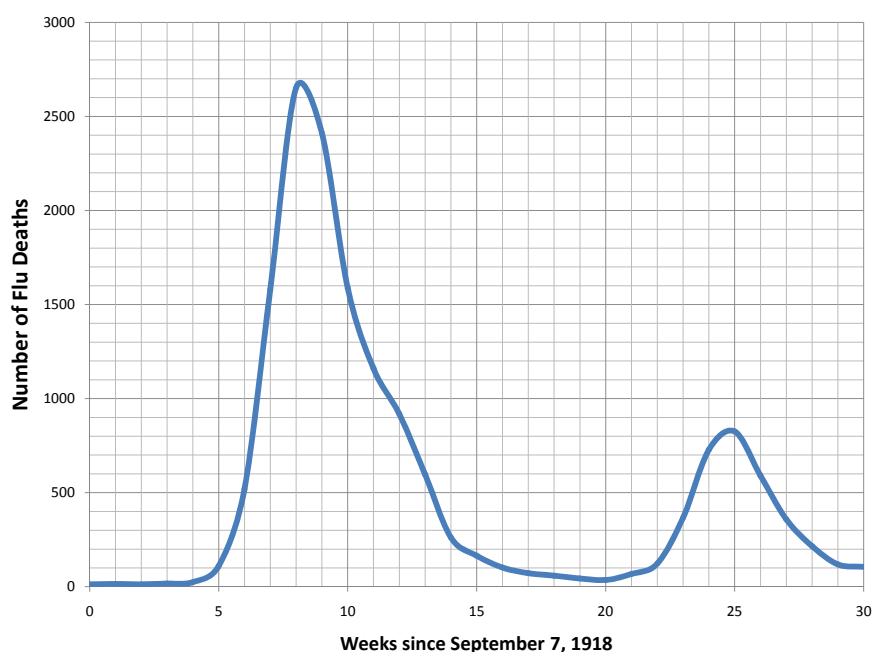
   Write the next answer in normal (expanded) decimal notation.
   (i) $4.35 \times 10^{16} =$

   Write the next answer in normal (expanded) decimal notation.
   (j) $4.35 \times 10^{-16} =$

2. The 1918 flu season was one of the deadliest in history. The graph and table show the number of flu deaths in London during 1918.

Weeks since Sept. 7, 1918	0	3	6	9	12	15	18	21	24	27	30
Number of deaths	13	17	519	2413	918	165	59	68	729	359	106

(a) How many people died from the flu 6 weeks after September 7?

(b) In which week(s) after September 7 did the number of flu deaths drop back to the level at 6 weeks?

(c) In what week after September 7 was the number of flu deaths the highest and what were the approximate number of deaths?

(d) Was the number of weekly flu deaths increasing faster 6 weeks after September 7 or 21 weeks after September 7? Explain. (*Hint: Determine the average rate of change at both of these times.*)

3. My plumber charges P dollars for H hours of work, as given by the following formula:

$$P = 24.95 + 85.00H$$

(a) Make a table of values showing the charges for 1 hour, $1\frac{1}{2}$ hours, 2 hours, and 3 hours.

(b) What does the 24.95 represent and what are its units?

(c) What does the 85.00 represent and what are its units?

(d) If the bill for my plumber's last visit was \$218.75, how much time did she work?

Set up and solve an equation to answer the question. If you can't solve it, then you may estimate the answer to two decimal places for possible partial credit.

(e) Convert your answer to the nearest minute.

She worked for _____hours, _____minutes.   .

4. The timing of the sunset depends on the latitude (how far North of South of the equator one is) and the time of year. In Minneapolis, the sunset occurred at 6:01 PM on March 1. The time of the sunset is expected to occur 1.26 minutes later each day. In Galveston, Texas, the sunset occurred at 6:19 PM on March 1 and is expected to occur 0.58 minutes later each day. (Note: do not worry about Daylight Savings Time.) If we let S represent the time of the sunset (in minutes since 6 PM) for D days after March 1, then the equations are:

$$\text{Minneapolis:} \quad S = 1 + 1.26D$$
$$\text{Galveston:} \quad S = 19 + 0.58D$$

The table shows sunset times for the two cities:

D	0	5	15	31
S (Minneapolis)	1	7.3	19.9	40.1
S (Galveston)	19	21.9	27.7	37.0

(a) Which city has a later sunset on March 10 (i.e. after 10 days)? *Justify your answer.*

(b) Draw a graph illustrating both equations.
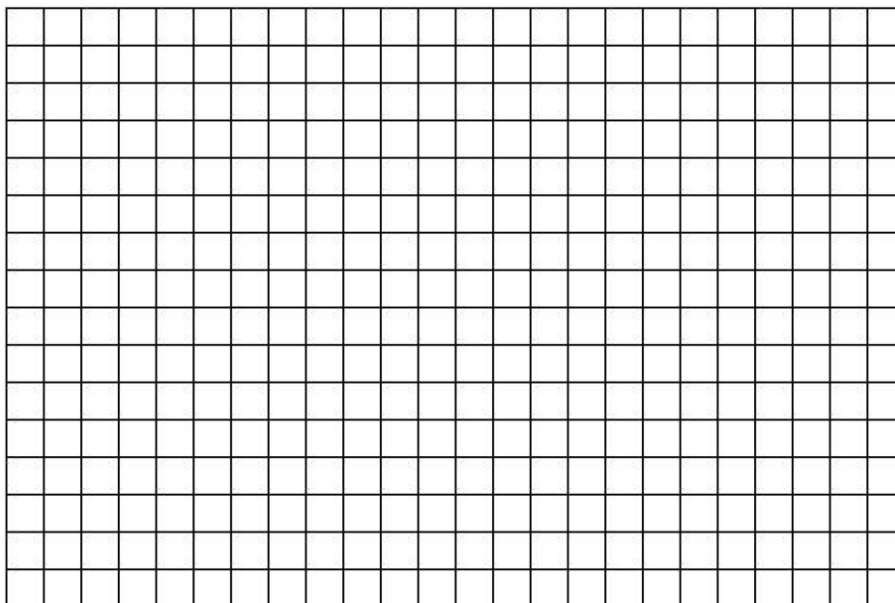
The problem continues on the next page ...

(c) Set up and solve an equation to find when the two cities will have the sunset at the same time. Report your answer to the nearest day.

Just approximating the answer will get almost no partial credit.

5. Joy jumped from a rock into an abandoned mining pit filled with water. The rock ledge was 10 meters above the ground. Her height above the water, H meters, after T seconds is given by the formula:

$$H = 10 + 3.2T - 4.88T^2$$

(a) Complete the following table of values.

Please report your answers to the first two decimal places.

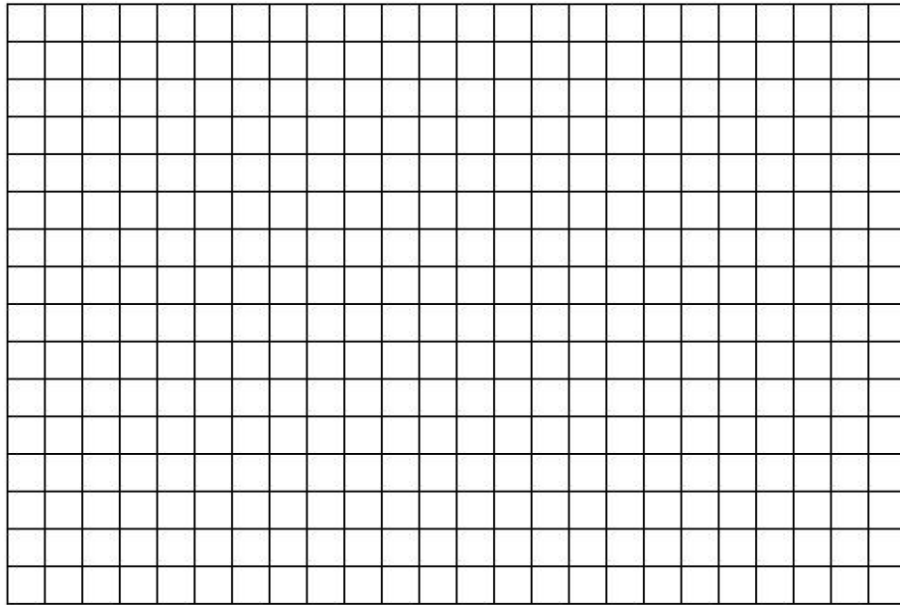| T	0	0.5	0.8	1.0	1.6	2.0
H						

(b) How high up in the air does Joy get?

Find the answer to two decimal places using whatever method you prefer.

(c) Convert your answer to the nearest foot. *Use 1 meter = 3.28 feet.*

The problem continues on the next page.

(d) Draw a graph illustrating the dependence.

(e) When does Joy hit the water?

Find the answer to two decimal places using whatever method you prefer.

6. A summit in Copenhagen, Denmark in late 2009 focused on climate change and its impacts. Increasing carbon dioxide emissions are a cause of concern because of their linkages to climate change. In 1959 (when modern instruments could first measure carbon dioxide concentrations), the average concentration in the Northern Hemisphere was 316 parts per million (ppm) CO_2. That is to say, there were 316 CO_2 molecules for every million molecules of air. In 2008, the concentration of CO_2 was 386 ppm CO_2. Assuming this increase is exponential, from 1959 to 2008 the CO_2 concentration grew at a rate of 0.41% per year. That is, the CO_2 concentration C (in ppm) Y years after 1959 is given by the equation:

$$C = 316(1.0041)^Y$$

(a) According to this equation, what will the CO_2 concentration be in 2010?

(b) If the value continues to increase, in what year will the CO_2 concentration be over 400 parts per million CO_2?

   Set up and solve an equation to answer the question. If you can't solve it, then you may estimate the answer for possible partial credit.

7. At Home Depot this week I bought too much stuff to fit in my car, so I rented their truck to haul the stuff to my house. The table below lists the rental charges for their truck. Home Depot charges an initial fee plus an hourly rate.

Hours	1	2	3	4	5	10
Cost	$28.95	$38.90	$48.85	$58.80	$68.75	$118.50

(a) Name the variables including units.

(b) What does Home Depot charge per hour to use the truck?

(c) What is the initial fee?

(d) Write an equation describing the cost of renting a truck.

8. I was boiling water on the stove for some tea. When I took it off the stove it was boiling at a temperature of 212 degrees Fahrenheit. The tea was cool enough to drink at a temperature of 100 degrees Fahrenheit 20 minutes later. You can assume that the coffee cools exponentially.

    (a) Name the variables, including units.

    (b) Write an equation describing the temperature of the tea as it cools.

    (c) What will the tea temperature be 10 minutes later (i.e. after 30 minutes total)?

    (d) By what percentage does the tea temperature decrease each minute?