

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.
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1. Evaluate each of the following expressions.

(a)  $49.99 + 1.07(300) =$

(b)  $(20)^2 - 4(-5)(3) =$

(c)  $2,400(1.06)^{72} =$

(d)  $\frac{-(20)}{2(-5)} =$

(e)  $2^{30} =$

(f)  $(9.2)^{1/4} =$

(g)  $\sqrt{179} =$

(h)  $\frac{\log(29.22)}{\log(1.04)} =$

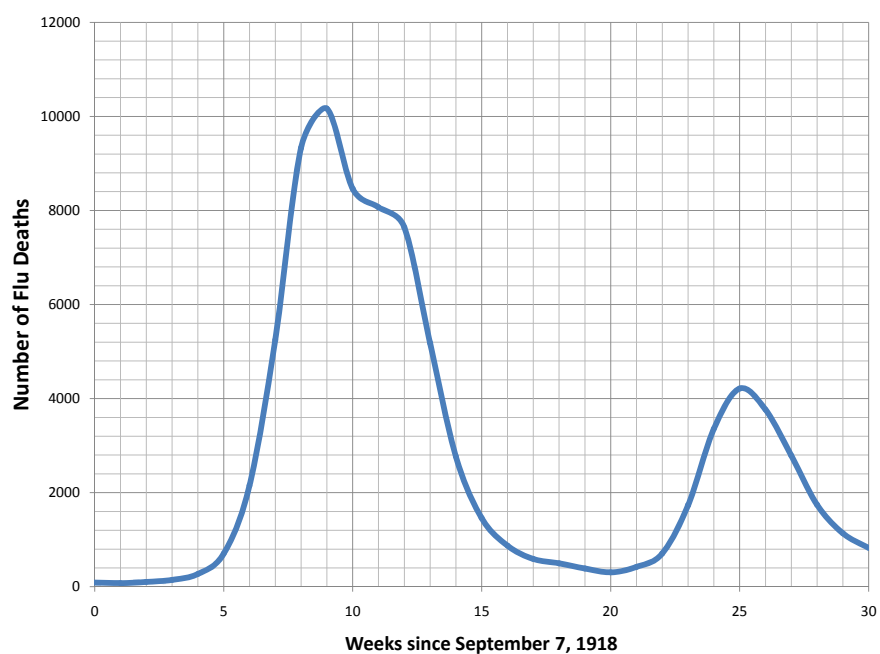
*Write the next answer in normal (expanded) decimal notation.*

(i)  $5.38 \times 10^{17} =$

*Write the next answer in normal (expanded) decimal notation.*

(j)  $5.38 \times 10^{-17} =$

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



Weeks since Sept. 7, 1918	0	3	6	9	12	15	18	21	24	27	30
Number of deaths	90	145	2148	10168	7642	1460	498	423	3360	2791	822

- (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 24 weeks after September 7? Explain. (*Hint: Determine the average rate of change at both of these times.*)

3. My mechanic charges  $M$  dollars for  $H$  hours of work, as given by the following formula:

$$M = 19.95 + 75.00H$$

- (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 19.95 represent and what are its units?

- (c) What does the 75.00 represent and what are its units?

- (d) If the bill for my last visit to the mechanic was \$638.70, how much time did he 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.

He 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 4:43 PM on January 1. The time of the sunset is expected to occur 1.19 minutes later each day. In Panama City, Florida, the sunset occurred at 4:54 PM on January 1 and is expected to occur 0.81 minutes later each day. (Note: do not worry about Daylight Savings Time.) If we let  $S$  represent the time of the sunset (in minutes after 4 PM) for  $D$  days since January 1, then the equations are:

$$\text{Minneapolis: } S = 43 + 1.19D$$

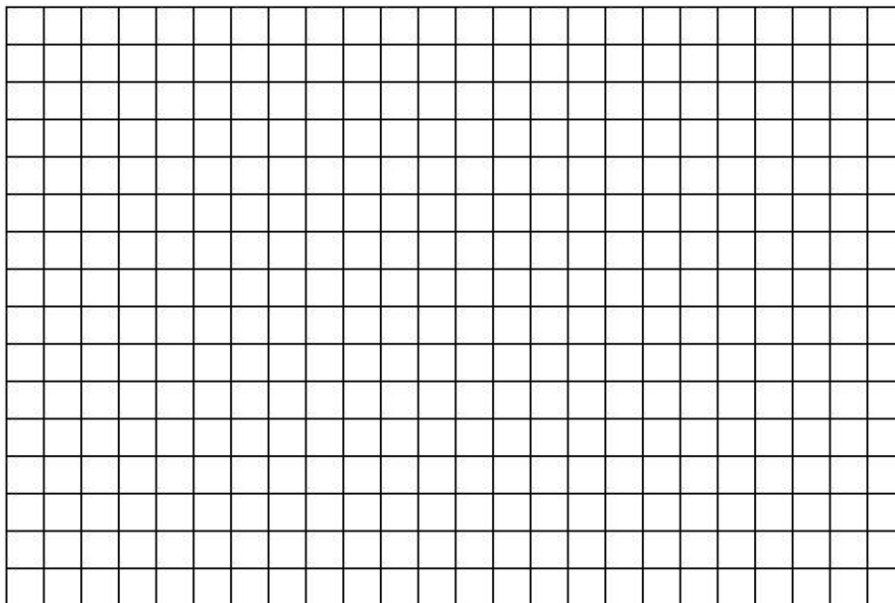
$$\text{Panama City: } S = 54 + 0.81D$$

The table shows sunset times for the two cities:

$D$	0	5	15	31
$S$ (Minneapolis)	43	49.0	60.9	79.9
$S$ (Panama City)	54	58.1	66.2	79.1

- (a) Which city has a later sunset on January 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. A diver jumps up in the air from a 7.5-meter board. His height above the water,  $H$  meters, after  $T$  seconds is given by the formula:

$$H = 7.5 + 3.1T - 4.88T^2$$

- (a) Complete the following table of values.

*Please report your answers to two decimal places.*

$T$	0	0.5	0.8	1.0	1.4	1.8
$H$						

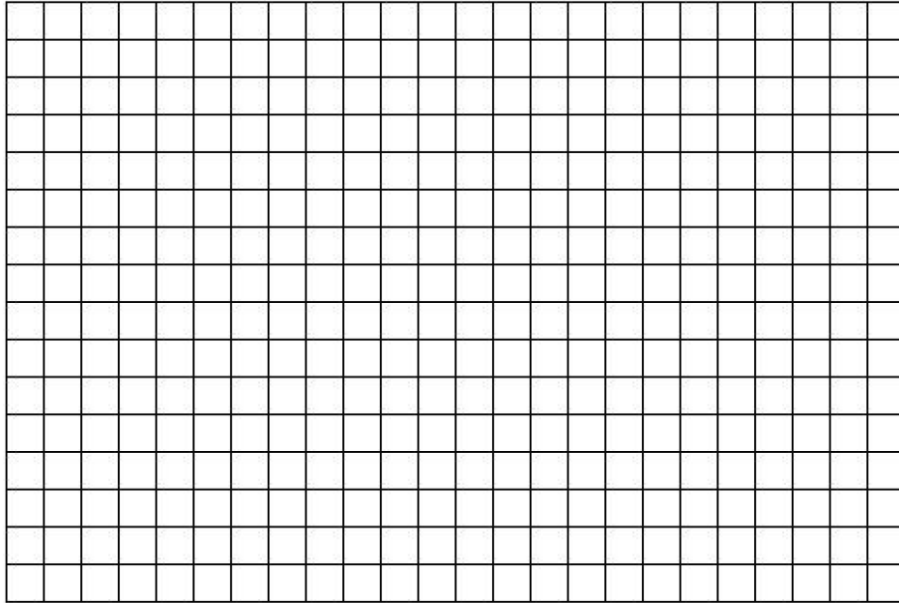
- (b) How high up in the air does the diver get?

*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 the diver 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<sub>2</sub>. That is to say, there were 316 CO<sub>2</sub> molecules for every million molecules of air. In 1990, the concentration of CO<sub>2</sub> was 354 ppm CO<sub>2</sub>. Assuming this increase is exponential, from 1959 to 1990 the CO<sub>2</sub> concentration grew at a rate of 0.27% per year. That is, the CO<sub>2</sub> concentration  $C$  (in ppm)  $Y$  years after 1959 is given by the equation:

$$C = 316(1.0027)^Y$$

- (a) According to this equation, what will the CO<sub>2</sub> concentration be in 2010?

- (b) If the value continues to increase, in what year will the CO<sub>2</sub> concentration be over 400 parts per million CO<sub>2</sub>?

*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. I had to rent a tile saw from Home Depot to finish a remodeling project. The table below lists the rental charges for the saw. They charge an initial fee plus an hourly rate.

Hours	1	2	3	4	5	10
Cost	\$35.90	\$51.85	\$67.80	\$83.75	\$99.70	\$179.45

(a) Name the variables including units.

(b) What does the Home Depot charge per hour for the tool rental?

(c) What is the initial fee?

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

8. Newspaper subscriptions have dropped as more people use the internet for news. In 2006, the Minneapolis Star Tribune had 606,698 subscribers. Today in 2009 (3 years later), only 322,360 people subscribe to the paper. You can assume that the decline is exponential.

(a) By what percentage has the number of subscribers dropped each year?

(b) If this trend continues, what will the number of subscribers be in 2012 (i.e. after 6 years from 2006)?