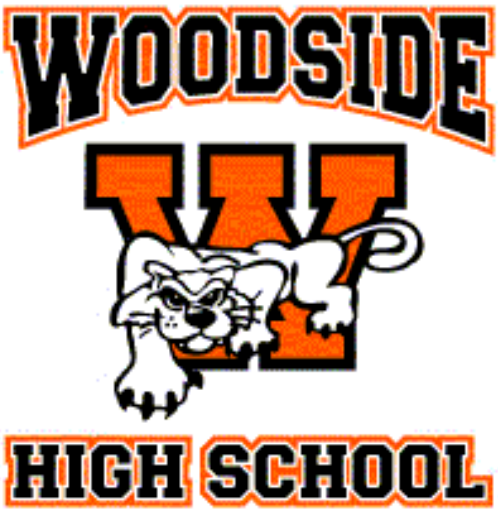
AP Calculus AB

Mr. Gelb E-23

Ms. Abel F-18

Summer 2020

Information Packet



*****Due to the nature of Calculus all previous mathematical skills are necessary and unavoidable. Therefore, students are still responsible for having all the pre-requisite knowledge required for this course. Many of these topics are included in this summer packet, but during the school year there is very little to no time to review previous concepts, so each student must take the initiative to master these pre-requisite skills. It is not fair to anyone, but it is what it is, and it's part of what you are signing up for.*****

Table of Contents

Name: _____

AB CALCULUS BOOT CAMP 2020

August 3 – 7

9 a.m. to 12 p.m.

Taught by Mr. Gelb in **room E-23***

- Review important concepts
- Strengthen algebra and trigonometry skills
- For the Boot Camp to replace Summer Assignment #1 you must attend EVERY DAY of the boot camp.

Sign-up with Mr. Gelb by emailing the completed form below to jgelb@seq.org by Friday, May 29, 2020+

* May be online

\+ To sign-up during the summer e-mail Mr. Gelb (jgelb@seq.org) for availability.

☒ **Yes, please register me for the summer AB Calculus Boot Camp.**
(Return completed form to Mr. Gelb jgelb@seq.org by 5/29/20)

WHS ID #: _____	**Counselor's Name: _____**	
Last name: _____	**First Name: _____**	**Current grade level:** ☐ 9th ☐ 10th ☐ 11th ☐ 12th
Phone #: (_____) _____–_____ (area code)	**Email address: _____@_____**	
Current Math Class: ☐ Precalculus ☐ Alg II/Trigonometry	**Current Math Teacher:** ☐ Mr. Kaddoura ☐ Ms. Nguyen ☐ Mr. Nguyen ☐ Ms. Lee ☐ Other	
Grade received 1st Semester in above math class: _____	**Current grade (2nd Semester) in your math class: _____**	
Areas of math where you know you need to improve:		

AB Calculus – General Information
Required Materials & Supplies

Name _____
Date _____ Period ____

Summer Assignment: A#1 This is an assignment for points —due 2nd day of class.

Texas Instruments 84 Plus CE

The learning of calculus has changed markedly in the last generation due to advances in technology. As a result, all students are required to have the **TI-84 Plus CE** calculator that will be used nearly every class day. The "C" stands for a color display, introduced by Texas Instruments in the Spring of 2015. The new model also has enhanced resolution. Make sure if you are buying a new calculator that it is this exact version—you will want the color display and convenience of a rechargeable battery. Students are allowed to use the calculator on a portion of every exam, including the AP exam and are expected to become highly proficient in its use. All teaching demonstrations will be done using the TI-84 Plus CE. The use of other models is strongly discouraged.

TI-84 Plus CE

- If you already own a calculator in the TI 84 family (or a TI-Nspire or TI-89) *do not* purchase a new calculator. You can learn to use your current calculator for AB Calculus purposes.
- On the other hand, if you do need to purchase a graphing calculator, make sure you get the TI-84 Plus CE.
- Shop around locally this summer and on the internet and get the best deal (last year we found prices around $110 at Target and Walmart during the summer), but be careful. It has been our experience in the past that many retailers offer a promotional price in early August and then raise their prices as soon as the first week of school hits. They also engage in bait and switch tactics saying they are out of one version and offering to sell an inferior version, say the TI 84+Silver (non-color version) for the same price.
- Please note that it is Woodside's policy that if a student cannot afford the calculator required for an AP course, one will be loaned to the student without charge. We can arrange for that the first week of school.
- Finally, note that the graphing calculator recommended above is permitted on the SAT, the ACT, and the College Board's subject area tests in mathematics. Students proficient in calculator use can do better on these tests.

Name: _____ Enrolling directly from: ☐Precalc ☐Alg II/Trig

Pre–Calculus Teacher:_____ Alg II/Trig Teacher: _____
School Attended Last Year: (only if you did NOT attend Woodside High School):_____

AP Calculus AB Summer Assignment #2 DUE DATE: The first day of class. No exceptions

As instructors of AB Calculus, we have extremely high expectations of students taking this course. We expect a certain level of independence and motivation to be demonstrated by anyone taking AB Calculus. Your first opportunity to demonstrate your capabilities and resourcefulness is through this summer assignment packet. Calculus builds on previous skills more so than any math class you have previously taken. This class will be easier if the tools you already have are honed and fresh in your mind. To that end we have prepared a packet to help you refresh the skills you will soon be asked to use. The goals of this packet are to stay current on your math skills and increase confidence, fluency, and accuracy with the foundational mathematics.

The specific topics in this packet were picked because students are consistently weak in them. These are skills that are used continually in AB Calculus. Please do not fake your way through these problems. If you have trouble answering any question, be resourceful. This might include looking through your old notes, going to the library for resource books, working with a friend, or checking Khan Academy. We have given you a few websites that may be helpful to solve these problems.

Do NOT use a calculator for any of these problems except the last topic. All these problems can be done without a calculator. While graphing calculators are mandatory for this AB Calculus, more than half of the AP exam is taken without a calculator. Please show all your work and steps neatly and clearly.

The packet is **due on the first day of school**. It is worth 25 points. If you forget to bring it with you, we will consider you unprepared for class and you will receive a zero for this assignment. The ONLY exception for not doing this packet is if you attend the entire week of Calculus boot camp.

Start this packet mid-July. Do NOT do it earlier. We want these skills and techniques to be fresh in your mind at the beginning of the school year. Also, do not wait to do them at the very last minute. These problems take time. If you do one concept a day, the whole packet will take you about two weeks to complete.

Good Luck,

AB Calculus Teachers
Mr. Gelb: jgelb@seq.org
Ms. Abel: label@seq.org

Topics

The topics listed are below. You can certainly do Google searches for any of these topics. We have given you several sites that will cover pretty much all of these topics.

1. Negative and fractional exponents
2. Long Division
3. Complex fractions
4. Factoring
5. Solving equations
6. Domain
7. Asymptotes and Intercepts
8. Composition of functions and Function Notation
9. Function transformation
10. Even and odd functions
11. Logarithms and Exponential functions
12. Trigonometry
13. Graphing
14. Dimensional Analysis

Many of the topics have listed specific websites to help you.
Here are some general helpful websites:

Algebra topics:
http://www.purplemath.com/modules/index.htm

Trigonometry:
http://math.com/homeworkhelp/Trigonometry.html
http://www.mathematicshelpcentral.com/index.html (Once in the site, go to lecture notes.)

Khan Academy:
https://www.khanacademy.org/ **(**Once in the site, use the search feature.)

AB Calculus – Summer Assignment
A#2 Summer Assignment

Name _____

Date _____Period _____

Instructions: **Answer completely, showing your thought process clearly and the work supporting your answer. Use a separate sheet of paper if necessary. Box your final answer.**

Topic 1: Fractional & Negative Exponents: Used throughout calculus (derivatives and integrals)
http://m.sparknotes.com/math/algebra2/exponentialfunctions/section1.rhtml

Simplify using only positive exponents

1. $-3x^{-3}$

2. $\left(16x^{2}\right)^{\frac{3}{4}}$

3. $x^{4}\left(-2x\right)^{3}\left(6x^{0}\right)^{-2}$

4. $\dfrac{\frac{1}{2}\left(2x+5\right)^{\frac{-3}{2}}}{\frac{3}{2}}$

5. $\dfrac{x^{\frac{3}{2}}}{x^{\frac{-5}{4}}}$

6. $\sqrt[3]{x^{5}} \bullet 3x^{3/4}$

7. $5^{x} \bullet 5^{\left(\frac{7}{2}\right)x}$

8. $27^{\frac{1}{3}} \bullet 8^{\frac{5}{3}}$

Topic 2: Long Division

http://m.youtube.com/watch?v=l6_ghhd7kwQ

Divide each polynomial using long division.

1. $(x^3 - 10x^2 + 20x + 26) \div (x - 5)$

2. $(x^4 - 3x^2 + 2) \div (x + 2)$

Find all the roots using long division and sketch the graph.

3. $3x^3 - 7x^2 - 22x + 8;\ 3x - 1$

4. $x^4 - 2x^3 - 3x^2 + 4x + 4;\ x + 1$

Topic 3 : Complex Fractions

http://www.purplemath.com/modules/compfrac.htmv

Simplify the following.

1. $\dfrac{x}{x-\frac{1}{2}}$

2. $\dfrac{\frac{1}{x}+4}{\frac{1}{x}-2}$

3. $\dfrac{x-\frac{1}{x}}{\frac{1}{x}+x}$

4. $\dfrac{\frac{3}{x}-\frac{4}{y}}{\frac{4}{x}-\frac{3}{y}}$

5. $\dfrac{\frac{x}{1-x}+\frac{1+x}{x}}{\frac{1-x}{x}+\frac{x}{1+x}}$

Topic 4: Factoring

Factor completely.

1. $x^3 + 8$

2. $27x^3 - 125y^3$

3. $2x^4 + 5x^3 - 3x^2$

4. $ac + cd - ab - bd$

5. $2\sqrt{x} - 6x^{\frac{3}{2}}$

Topic 5: Solving Equations
Solve.

1. $2x^2 - 3x + 3 = 0$

2. $\dfrac{x}{2x-6} - \dfrac{3}{x^2-6x+9} = \dfrac{x-2}{3x-9}$

3. $x + \dfrac{1}{x} = \dfrac{13}{6}$

4. $\dfrac{x-5}{x+1} = \dfrac{3}{5}$

5. $\dfrac{x+1}{3} - \dfrac{x-1}{2} = 1$

6. $x^4 - 9x^2 + 8 = 0$

Topic 6: Composition of functions and Function Notation: FTC and limits

http://www.purplemath.com/modules/fcncomp3.htm
https://www.mathsisfun.com/sets/functions-composition.html

1.. Find $f(1)-f(5)$ given $f(x)=|x-3|-7$

2. Find $f(x+2)-f(2)$ given $f(x)=x^2-3x+4$

3.. Find $f(x+h)$ given $f(x)=x^2+2x+1$

4. Find $\dfrac{f(x+h)-f(x)}{h}$ given $f(x)=3x^2+1$

If $f(x)=x^2+3$, $g(x)=2x-1$, and $h(x)=2^x$, find the following

5.. $f(g(2))$

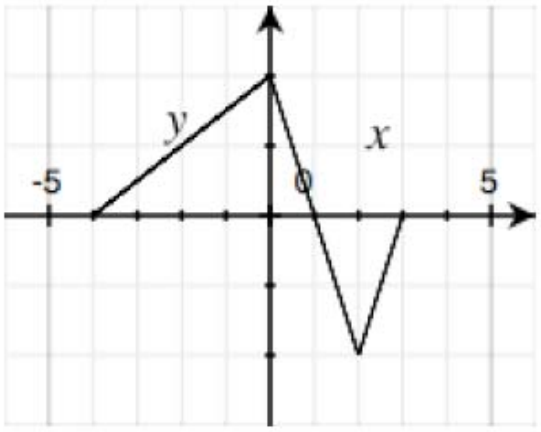
6. $f(h(-1))$

Topic 7: Function transformation

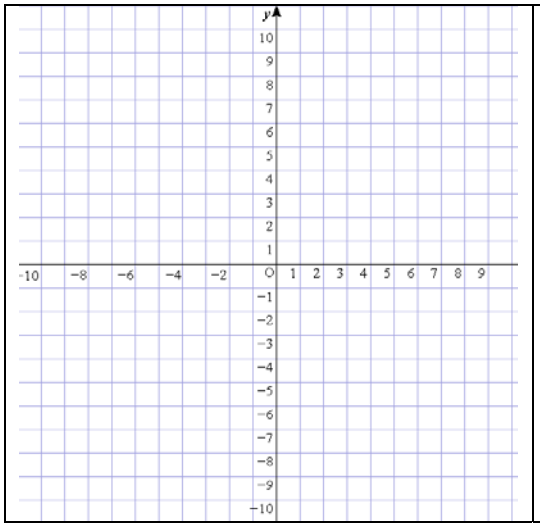
If $f(x) = x^2 - 1$, describe in words what the following would do to the graph of f(x):

1. $f(x) + 3$
2. f(x + 4)
3. –f(x + 2)

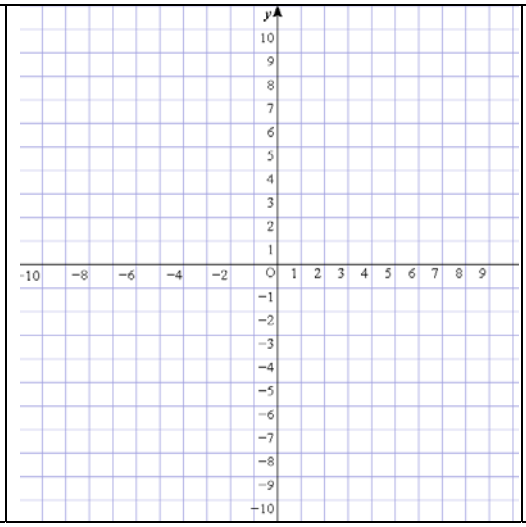
Below is the graph of $y = g(x)$. Sketch the following graphs.



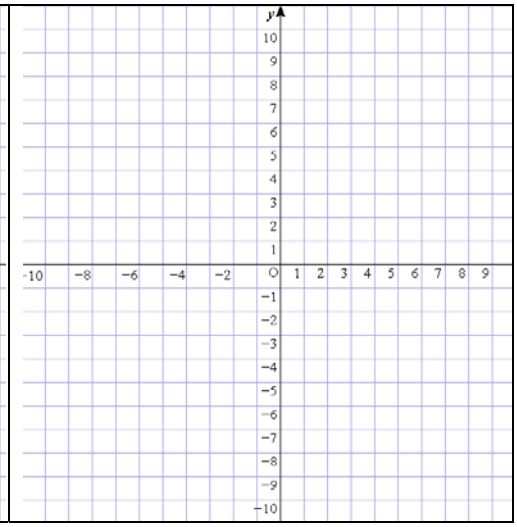
4. $y = 2g(x)$



5. $y = g(3x)$



6. $y = g|x|$



Topic 8: Domain
http://www.freemathhelp.com/domain-range.html
http://www.mathisfun.com/definitions/domain-of-a-function.html

Use **set and interval notation** to identify the domain for each of the following functions:

1. $y = \dfrac{3x-2}{4x+1}$

2. $y = \dfrac{x^2-4}{2x+4}$

3. $y = \dfrac{x^2-5x-6}{x^2-3x-18}$

4. $y = \sqrt{x^2-5x-14}$

5. $y = \dfrac{\cos x}{x}$

6. $y = \ln(8x^3-27)$

7. $y = \log(2x-12)$

Topic 9: Asymptotes and Intercepts
www.purplemath.com/modules/grphrtnl.htm

For each function, find the equations of both the vertical asymptote(s) and horizontal asymptotes (if they exist) and ALL intercepts.

1. $f(x) = e^{-x} - 3$

2. $y = \dfrac{x}{x-3}$

3. $y = \dfrac{x+4}{x^2+1}$

4. $y = \dfrac{x^2-2x+1}{x^2-3x-4}$

5. $y = \dfrac{x^2-9}{x^3+3x^2-18x}$

Topic 10: Even and odd functions
www.purplemath.com/modules/fcnnot3.htm
www.mathisfun.com/algebra/functions-odd-even.html

Show all your work to determine if the relation is even, odd, or neither.

1.. $f(x) = x^2 - 7$

2. $f(x) = -4x^3 - 2x$

3. $f(x) = \dfrac{x+2}{x^4+3}$

4. $f(x) = x - \dfrac{1}{x}$

5. a) How do you determine **algebraically** if a function is even, odd, or neither?

b) How do you determine **graphically** if a function is even, odd, or neither?

Topic 11: Logarithms and Exponential Functions
http://www.mathsisfun.com/algebra/exponents-logarithms.html

Write as one expression.

1. $2\ln(x-3)+\ln(x+2)-6\ln x$

2. $\frac{1}{3}\left[\log_2(x)+\log_2(x-4)\right]$

Expand each of the following using the laws of logs.

3.. $\log_3 5x^2y^4$

4. $\ln\frac{6x}{y^2}$

Solve for x.

5. $5^x=125$

6. $81^{\frac{3}{4}}=x$

7. $8^{x+1}=16^x$

8. $\ln 1-\ln e=x$

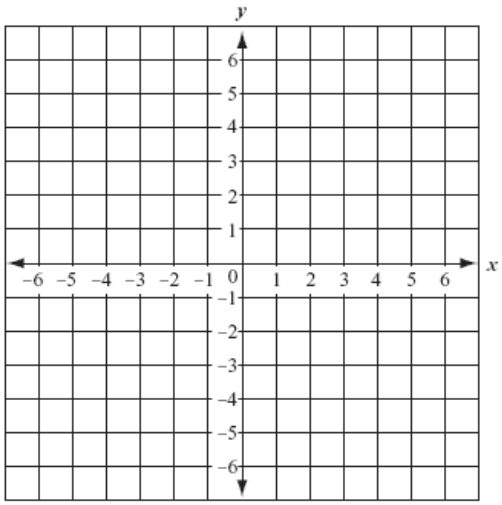
9. $\ln e^3=x$

10. $e^{\ln 7}=x$

11. a) Graph $y = 3^x$

b) Graph its inverse.

c) What is the equation of the graph in part 'b'?



For each function find its inverse algebraically.

12. $y = \sqrt{3x - 2}$

13. $y = \frac{4}{x} - 2$

14. What is the relationship of the graph of a function and the graph of the function's inverse?

Topic 12: Trigonometry

If the point *P* is on the terminal side of θ, find all 6 trig functions of θ. Draw a picture.

1. $P(-2,4)$

2. $P(\sqrt{5},-2)$

3. If $\cos\theta = -\frac{5}{13}$, θ in quadrant II, find $\sin\theta$ and $\tan\theta$.

4. If $\cot\theta = 3$, θ quadrant III, find $\sin\theta$ and $\cos\theta$

Evaluate. No decimals. Reminder: NO calculators.

5.. $\cos\frac{\pi}{2}$

6.. sin 0

7. $\tan\frac{\pi}{4}$

8. $\cos\frac{\pi}{4}$

9. $\sin\frac{\pi}{3}$

10. $\sin^{-1}\frac{\sqrt{3}}{2}$

11. $\tan^{-1}1$

12. $\cos^{-1}\frac{1}{2}$

13. $\sec^{-1}\sqrt{2}$

More Trig

14. Which of the following expressions are identical?

a) $\cos^2 x$ b) $(\cos x)^2$ c) $\cos x^2$

15. Which of the following expressions are identical?

a) $(\sin x)^{-1}$ b) $\arcsin x$ c) $\sin x^{-1}$ d) $\dfrac{1}{\sin x}$

Complete the following trig identities.

16. $\sin^2 x + \cos^2 x =$ 17. $\tan^2 x + 1 =$ 18. $\dfrac{1-(\sin x+\cos x)^2}{2\sin x} =$

Solve each equation on the interval [0, 2π)

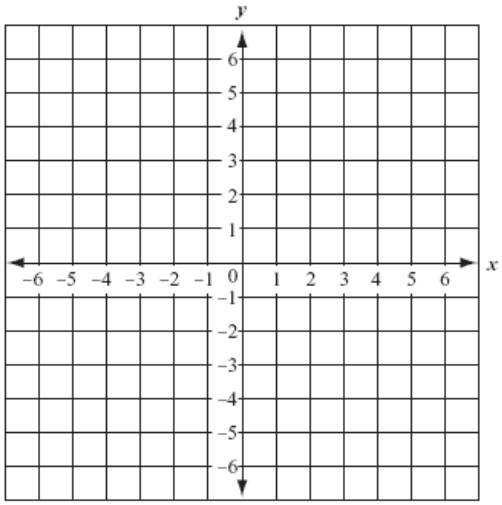
19.. $\sin x = 1$ 20. $3\cos x - 1 = 2$

21. $\tan^2 x - 1 = 0$ 22. $2\sin^2 x + \sin x = 1$

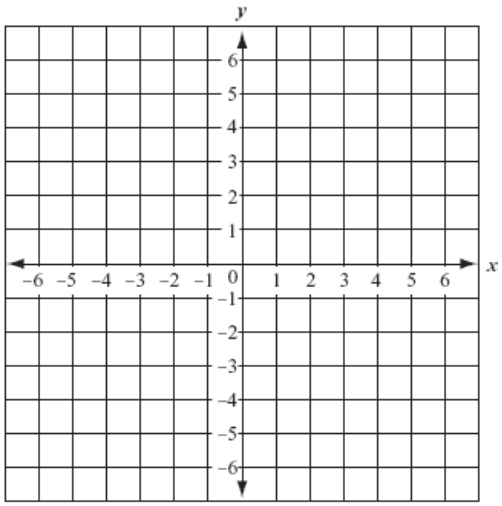
Topic 13: Graphing

Graph the following equations.

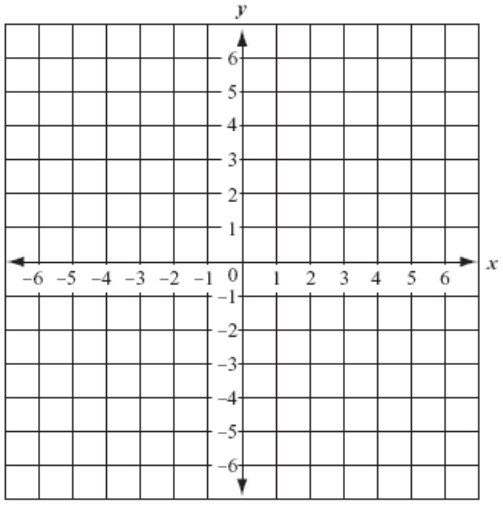
1. $y = 3(x-4)^2 + 1$



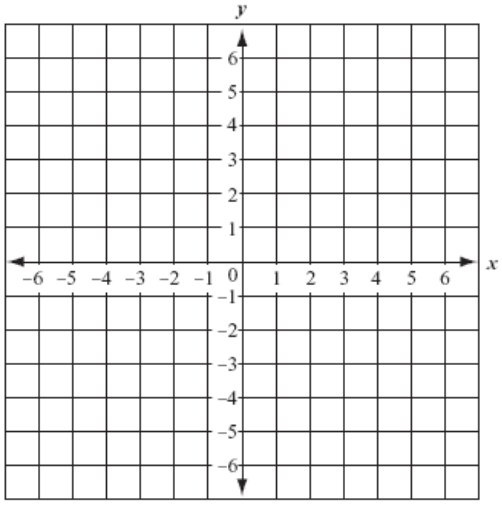
2. $y = -2|x+5|$



3. $y = \begin{cases} -x^2 & \text{if } -2 \le x < 1 \\ -2 & \text{if } x = 1 \\ 3x - 6 & \text{if } 1 < x \le 3 \end{cases}$



4. $y = \dfrac{4}{x-1}$



Topic 14: Dimensional Analysis

www.math-salamaders.com/metric-to-standard-conversion-chart.html

https://www.khanacademy.org/math/algebra/introduction-to-algebra/units-algebra/v/dimensional-analysis-units-algebraically

Dimensional analysis is a way to convert between units using unit rates. We use it throughout calculus especially with word problems. It is important to have the correct units in your answers.

Solve each problem using dimensional analysis. Every number must have a unit. Work must be shown. You may use your calculator to obtain the final answer. Round all answers to the third decimal place. All answers must be expressed in the correct units.

Solve each problem using dimensional analysis. Every number must have a unit. Work must be shown. You may use your calculator to obtain the final answer. Round all answers to the third decimal place. All answers must be expressed in the correct units. Unless provided, you will need to find the conversion factors on your own. Websites are listed above to help you.

1) An athlete runs a distance of 5,200 meters. If she is able to maintain a pace of 4.4 meters per second, how long does it take to her to run that distance?

A) in seconds?

B) in minutes?

2)
A) A family pool holds 10,000 gallons of water. How many liters is this?

B) The pool is drained by a pump at a rate of 30 liters per minute. How many hours does it take to empty the pool?

3) The moon is 250,000 miles away from the earth. A rocket flies to the moon at an average speed of 1200 miles per hour. How many days will it take to get there?

4) Indira was pulled over on her way from Los Angeles to San Jose by an officer claiming she was speeding. The speed limit is 65 mi/hr and Indira had traveled 150 km in 102 minutes. How fast was her average speed? Does she deserve a ticket?

5) In Raiders of the Lost Ark, Indiana Jones tried to remove a gold idol from a booby-trapped pedestal. He replaces the idol with a bag of sand. If the idol has a mass of 2.00 kg, how many liters of sand must he place on the pedestal to keep the mass sensitive booby-trap from activating? (Density of sand is 3.00 g/cm^3)