Note: Problem set is due by noon due to extended weekend.

1) A point moves so that its distance from the point A(–5,0) is always twice its distance from the point B(5,0).

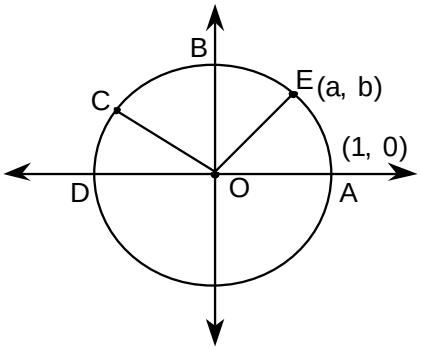
   a. Derive the equation of its locus and simplify the equation.
   b. Sketch the graph of the equation.

2) Find the exact value of x:

   a. $\log_{1/3}\left(\frac{1}{81}\right) = x$ b. $\log_{1/81}\left(\frac{1}{3}\right) = x$ c. $\log_x\left(\frac{1}{81}\right) = \frac{1}{3}$

   d. $\log_{1/81} x = \frac{1}{3}$

3)



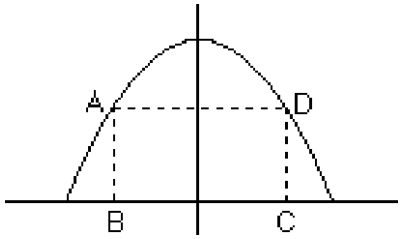
a. Find the length of arc AEB in terms of π.

b. Find the length of arc ABC in terms of π if ∠COD equals 30 degrees.

c. Find the coordinates of (a,b) if ∠EOA = 45°.

4) A rectangle has two vertices on the x-axis and two vertices above the x-axis on the curve $y = 64 - x^2$.

a. Write a function describing the area of the rectangle; A(x) = Include the domain of A.
b. Graph the function.
c. What is the maximum possible area of the rectangle? Explain your reasoning.



5) Let $D(x) = 2x^4 - 3x^3 + x^2 + 5x - 4$

   a. Determine the remainder if $D(x)$ is divided by $x+1$.
   b. Determine the y-intercept of $y = D(x)$
   c. Determine whether 2 is a zero of the function $D(x)$.

6) Find the exact value of: $\sum_{n=3}^{25}\left(\frac{1}{n}-\frac{1}{n-1}\right)$, Hint: Do not simplify and examine several terms before you do any arithmetic.

7) Write the equation of each parabola, $y=f(x)$, under the following conditions:

a. vertex (–2,5) and *y*-intercept at –1.
b. passing through (1,0), (2,–5), and (3,–8).
c. zeros at 7 and –1 passing through $\left(-3,\frac{5}{2}\right)$.

8) Use algebraic techniques to find all $a+bi$ such that $a+bi^{\,2}=i$, that is, find the square roots of *i*.

9) An equation of the form $2x^3+ax^2+bx+c=0$ has roots of –2 and $3\pm 2i$. Determine (*a*,*b*,c).

10) A fifth degree function has a "bounce" point at 3, a "pass through" point at –2 and two other roots of $3\pm 2i$. Find the function of lowest degree if its *y*-intercept value is –10. Leave your answer in factored form.

11) Determine the amount of time it takes to at least double your money in an investment.

a. 6.2% compounded monthly. Give your answer in years and whole months.

b. 6.2% compounded continuously. Give your answer in years to two decimal places.

12) On the following page is a data analysis problem. You are to use the techniques you learned in unit 1 and making use of Excel as you did in the light intensity lab. Attach your Excel document with graphs to your answer sheets. In the space provided on the answer sheet, answer parts B, C, and D. Be sure to show your thinking.

Note: The next time you are asked a question like this it will be in a testing situation, so make sure you master the skills in Excel and the mathematics you apply.

12) Starbucks

Starbucks is a company that has expanded very quickly. Their aim is to be a widely recognized and respected brand. They want people to be able to find Starbucks coffee close by, wherever they might be. However, they did start small. Below is some data on the number of stores in various years. (from starbucks.com, history page)

Year	Number of stores
1971	1
1987	17
1988	33
1989	55
1990	84
1991	116
1992	165
1993	272
1994	425
1995	676
1996	1015
1997	1412
1998	1886
1999	2135
2000	3501
2001	4709
2002	5886
2003	7225
2004	8337

A) Plot this data to get a sense of the growth of the company. Let 1971 =1, 1987 = 17, etc. So your independent variables are from 1 through 34.

B) There is a period of a year or two where the pattern seems to change somewhat. What might have caused this change?

C) Find a regression model all entries on this table. Show your algebraic work (converting to a non-logarithmic equation) on your answer sheet.

D) According to your model, how many Starbucks stores do you predict there are in 2010?