MATH MATTERS
History of Calculus

Answer the following questions using:

- Story of Mathematics website at http://www.storyofmathematics.com
- History of Calculus poster emailed to you:

You do not need to write in complete sentences.

Precursors to the Development of Calculus

1. Greeks—The Method of Exhaustion was invented by Eudoxus of Cnidus and applied by Archimedes.
   a) Find Archimedes on the Story of Mathematics website and explain how the Method of Exhaustion works to find the area of a circle.
   b) What Calculus method have you recently learned that is similar to the Method of Exhaustion.

2. What significant event(s) occurred during the medieval times (300 A.D.—1300 A.D.)?

Use the Story of Mathematics website to identify the significance of each of the following mathematicians in the development of Calculus.

3. For each mathematician listed below, read his accomplishments, and then provide (a) the dates of his mathematical work and (b) a description of his accomplishments that relate to the development of calculus.
   a) Al-Khwarizmi
   b) Descartes
      i. Dates
      ii. What mathematical symbolism (that you have used in any Algebra-based class nearly every day) did Descartes develop in his *La Geometrie*?
      iii. What is the formal name of the second key concept he developed in *La Geometrie*? How do you use it on a regular basis? Why do you think it was given that name?
      iv. The above concept led to his most ground-breaking work. What is it and why was it so significant?
      v. What two non-mathematical areas did Descartes make significant contributions to? What quotation is Descartes' most notable statement?
   c) Fermat—See poster.

Development of Calculus

4. Isaac Newton (see website)
   a) Newton called a period of two years the "wonderful years" as they forced him to leave London and retire to his country estate. Within mathematics, they are called the "miraculous years." What world-wide event occurred at this time?
   b) What 3 major discoveries did Newton make during this time period?
   c) What names did Newton give to what we now call differential & integral calculus?
   d) In 1687 Newton published his *Principia*. What was its full name, how significant was it, and what concepts did he present in it.
   e) What real world concepts did Newton's work allow mathematicians and engineers to understand?

5. Gottfried Leibniz
   a) What was Leibniz trying to calculate (a topic that you study as well) that led to his development of Calculus? (poster)
   b) What derivative rules did Leibniz develop? (poster)
   c) What two notations, commonly used in Calculus today, did Leibniz develop? (website)
   d) For what non-mathematical area of study is Leibniz most famous? What was his “day job”? (website)
   e) Name 3 other mathematical advances credited to Leibniz. (website)

6. Calculus Controversy (see poster)
   a) What was the primary cause of the controversy over who should receive credit for the development of Calculus?
   b) What were the dates of discovery and publication for each man? Why did these dates create the controversy?
   c) At the time, who was given credit for the development of Calculus by the Royal Society?
   d) Who had great influence over this decision and why was this unfair?
   e) Why was the controversy of such importance outside the world of mathematics? What were the repercussions on mathematics because of this?
   f) Who is given credit today for the development of Calculus?

7. Refining Calculus
   Leonhard Euler (see his page on website)
   a) What two amazing personal skills did Euler have that allowed him to continue his mathematical studies even after going blind?
   b) What mathematical symbols did he popularize?
   c) How did his standardization of mathematical symbols help the study of mathematics?
   d) What two formulas did Euler develop and why are they considered to be some of the most beautiful formulas in mathematics?
   e) Name two other advances he made to the study of Calculus.