Problems for CAS Solution

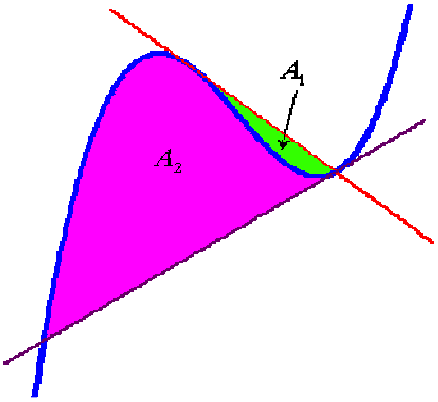
Presented by

Lin McMullin

1. Prove that the graph of every cubic polynomial has a point of symmetry (or the graph is symmetric to its point of inflection).

2. Prove that the tangent line drawn to a cubic polynomial at the point where x = average of two of its roots, intersects the polynomial on the x-axis at the third root.

3. Draw a tangent line at any point, other than the point of inflection of a cubic polynomial. This tangent will intersect the cubic at a second point; draw a tangent line at this second point. The second tangent will intersect the cubic at a third point. Let A_1 be the area of the region between the first tangent line and the cubic and let A_2 be the area of the region between the cubic and the second tangent line. A general graph is given below. The interesting result is that the ratio $A_2 : A_1$ is constant.

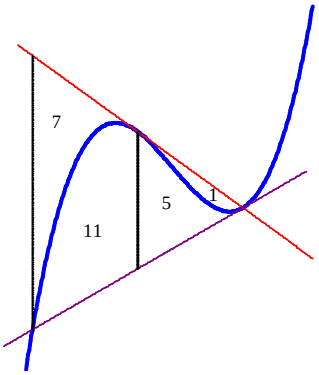


(A) Find the ratio A_2: A_1.

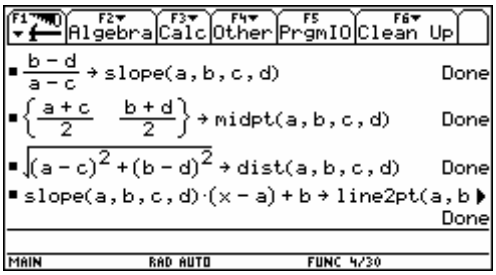
(B) Prove that the ratio is constant.

Suggested by *Algebra in Motion* by Audrey Weeks at www.calculusinmotion.com

And some other Ratios:



Analytic Geometry:



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4. Given the quadrilateral with vertices
   $A(-5, 2)$, $B(11.3, 7.1)$, $C(16.4, 5.0)$ and $D(0.1, -0.1)$
   (a) Show that *ABCD* is a parallelogram.
   (b) Are the diagonals perpendicular? Show how you know.
   (c) Show that the diagonals bisect each other.

5. Given the points $A(-3, 2)$ and $B(5, 4)$
   a. Find the length *AB*.
   b. Write an equation of the perpendicular bisector of $\overline{AB}$.
   c. Write an equation of the set of points (*x, y*) such that the sum of the distances from (*x, y*) to *A* and *B* is 9.
   d. Graph the locus found in part (c).

6. Trigonometry.
   a. SSS: A triangle has sides of 4.5, 6 and 8. Find the measure of the angle opposite the side of 6.
   b. SSA: In triangle ABC, angle A = 37.8^o, side *b* = 8.75 and side *a* = 6. Find the measure of length of side AB = *c*.
   c. SSA: In triangle ABC, angle A = 37.8^o, side *b* = 8.75 and side *a* = 3. Find the measure of length of side AB = *c*.
   d. SSA: In triangle ABC, angle A = 37.8^o, side *b* = 8.75 and side *a* = 9. Find the measure of length of side AB = *c*.
   e. ASA : In triangle ABC, angle A = 50.7^o, angle B = 43.5^o and AB = 15. Find the lengths of the other 2 sides.

7. Where else does the line through the points of inflection of a 4^{th} degree polynomial intersect the polynomial?

8. How is doing math with a CAS different than do math without a CAS?

9. What are the implications for teaching?

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Lin McMullin
Director of Mathematics Programs

National Math and Science Initiative
Suite 2900
325 N. St. Paul Street
Dallas, TX 75201

214.665.2500 (Main)
214.665.2516 (Direct)
214.665.2525 (Facsimile)

Supporting math and science education for America's future

www.nationalmathandscience.org

Web site: www.linmcmullin.net

Theorem of the Day
http://www.theoremoftheday.org/ and specifically theorem # 165 http://tinyurl.com/LinMc