Problems for CAS Solution

Presented by

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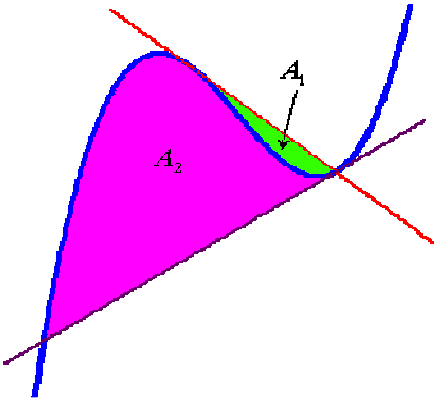
1. Prove that the graph of every cubic polynomial has a point of symmetry (or the graph is symmetric to its point of inflection).

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.

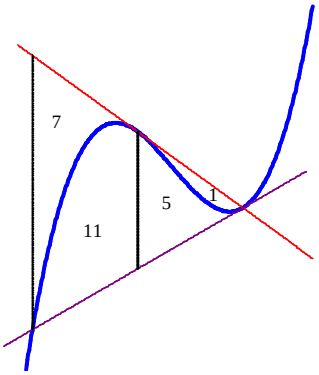


(A) Find the ratio A_2: A_1.

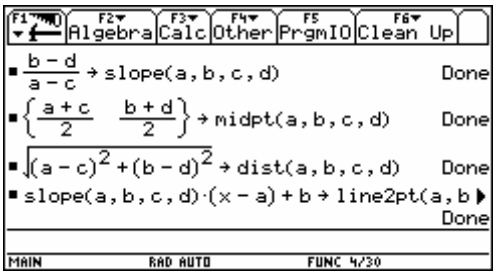
(B) Prove that the ratio is constant.

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

And some other Ratios:



Analytic Geometry:



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?