

MATH 205: EXTRA CREDIT PROBLEMS

SPRING 2009

Extra Credit 1 (February 2). Use the bisection method to find the “middle” solution of $3x^3 - 15x^2 + 6 = 0$ to five decimal places. No credit will be given without documentation of your work.

Extra Credit 2 (February 9). Suppose $f : [0, 1] \rightarrow [0, 1]$ is continuous. Must the equation $f(x) = x$ have a solution? If not, draw a counterexample. If so, explain why.

Extra Credit 3 (February 23). Let $f(x) = \ln x$ and $q(x) = ax^2 + bx + c$. Find a , b and c so $f(1) = q(1)$, $f'(1) = q'(1)$ and $f''(1) = q''(1)$.

Extra Credit 4 (March 9). A 20 foot ladder leans against a 12 foot high wall with the top of the ladder projecting over the wall. Its bottom is pulled away from the wall at 5 feet per second. How fast is the height of the top of the ladder decreasing when the top of the ladder reaches the top of the wall?

Extra Credit 5 (March 24). A water tank has the shape of a cone 16 ft high with a radius of 4 ft at the top. Water is being pumped in at 10 ft^3 per minute and is being removed from the bottom. At the time the water is 12 ft deep, the depth is increasing at 4 inches per minute. How fast is the water being removed?

Extra Credit 6 (March 31). For n a positive integer, graph $y = x^n/e^x$. Indicate all critical numbers, inflection points and asymptotes. (Make sure you tell how the shape of the graph depends on n .)

Extra Credit 7 (April 7). A ball of radius r is placed into a right circular cone. If V_b is the volume of the ball and V_c is the volume of the cone, then minimize V_c/V_b .

Extra Credit 8 (April 14). A fixed circle lies in the plane. A triangle is drawn inside the circle with all three vertices on the circle and two of the vertices at the ends of a diameter. Where should the third vertex lie to maximize the perimeter of the triangle?