MSCS Mess

Department of Mathematics, Statistics and Computer Science
St. Olaf College
Northfield, MN 55057

April 18, 2005
Volume 33, No. 19

This Week's Colloquium

Title: Palantir Project
Speaker:
Time: Tuesday, April 26th, 7:00 pm
Place: SC186

Come join in the official opening of the graphics lab and beginning of the Palantir Project: 7pm Tuesday in Science Center 186. After months of preparation and significant infrastructure development, we have a place for communication, visualization, and research that we hope will delight your senses. The presentation will include

- 3D stills and video, from on and off campus
- cool projects created during the graphics seminar
- research in computer vision

We hope that you will enjoy and consider using this space for your own projects. You'll be surprised how little is required to get started.
Come check it out: we'll provide the polarized glasses and the food.

[A joint production of the CS program and MDC/IIT]

Problem of the Week

What is the fifth digit from the end (the ten thousands digit) of the number

$$5^{5^{5^{5^{5}}}} ?$$

Yes, that is indeed ((((5 to the fifth) raised to the fifth) raised to the fifth) raised to the fifth).

*** Please submit all solutions by Wednesday at noon to Amelia Taylor (e-mail: ataylor@stolaf.edu) or by placing them in her box at OMH 201.

Senior Math Banquet

Last Week's Problem

Last week we had a calculus challenge that has at least 3 different solutions:

$$\int (x^6 + x^3)\sqrt[3]{x^3 + 2}\,dx$$

Congratulations to **Adam McDougall '05** and **Paul Tviete '07**, Calculus 2 tutors extraordinaire for their their solutions. I know of at least three distinct possible solutions. I will include my two favorite, one of which is Adam's and the other Paul's.

Solution 1: First move one factor of x inside the square root. This gives

$$\int (x^6 + x^3)\sqrt[3]{x^3 + 2}\,dx = \int (x^5 + x^2)\sqrt[3]{x^6 + 2x^3}\,dx$$

Now set $u = x^6 + 2x^3$,
so $du = 6x^5 + 6x^2 dx = 6(x^5 + x^2)dx$

Substitution then gives that

$$\int (x^5 + x^2)\sqrt[3]{x^6 + 2x^3}\,dx = \frac{1}{6}\int u^{\frac{1}{3}}du$$

$$= \left(\frac{1}{6}\right)\left(\frac{3}{4}\right)u^{\frac{4}{3}} + C = \frac{1}{8}(x^6 + 2x^3)^{\frac{4}{3}} + C$$

Solution 2: First, using the substitution

u = x^3+ 2, int x^2 (x^3+2)^(1/3) dx = 1/3 int u^(1/3) du = 1/4(x^3+2)^(4/3) + C. Let A = int x^6 (x^3 + 2)^(1/3) dx and B = int x^3 (x^3 + 2)^(1/3) dx.
Observe A = int x^4(x^2) (x^3 + 2)^(1/3) dx, so we can do integration
by parts on this integral with u = x^4, du = 4x^3 dx, dv = (x^2) (x^3 +
2)^(1/3) dx, and v = 1/4(x^3+2)^(4/3). Then A+B = 1/4x^4 (x^3+2)^(4/3)
- A - 2B + B. Thus 2(A+B) = 1/4x^4 (x^3+2)^(4/3) and int (x^6 + x^3) (x^3 + 2)^(1/3) dx = A+B = 1/8x^4 (x^3+2)^(4/3) + C = 1/8(x^6 + 2x^3)^(4/3)+C.

***If you would like to receive a copy of the Math Mess in your P.O. Box weekly, please e-mail Donna Brakke at brakke@stolaf.edu.

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