

A Carnival of Calculus

by Dan Margalit

How do you get upwards of 180 Calculus students to hang out in the math department after hours on a Tuesday night, giggling in the hallways, and playing mathematically themed party games?

Was it the candy corn? The balloons? Well, most likely it was the promise of that sweetest of pedagogical nectars: extra credit.

Our department at the University of Utah has long had a tradition of holding Calculus contests. Over time the format has run the gamut from straightforward Calculus exams to “Who Wants To Be A Mathionnaire?” In recent years, though, interest had been waning to the point where only a handful of math majors were showing up.

This year, Angie Gardiner, Julien Paupert, and I set out to improve attendance for this event. Also, in the spirit of the NSF VIGRE program, we wanted to attract more first year Calculus students. We came up with 3 guiding principles:

- (1) There should be extra credit.
- (2) First year Calculus students should be able to win.
- (3) The games should be fun.

We quickly settled on the philosophy of imitating party games, and, because of lack of space, decided to have the different games in different rooms, or “booths”. With these ideas, the Calculus Carnival was born.

I timidly mentioned the idea of a Calculus Carnival to my Calculus I class, and I was amazed when about half of the students expressed interest (actually, at first only one student was interested, but then I mentioned Guiding Principle #1).

Before long we had a small army of Calculus teachers in the department who were recruiting students to participate. A key idea that helped win the teachers over was to have a “carnival currency”; that is, at the Carnival itself, students would only win smiley face stickers, and each teacher could then devise his or her own scheme for awarding extra credit based (or not based) on the number of stickers each student won.

The next step was coming up with the actual

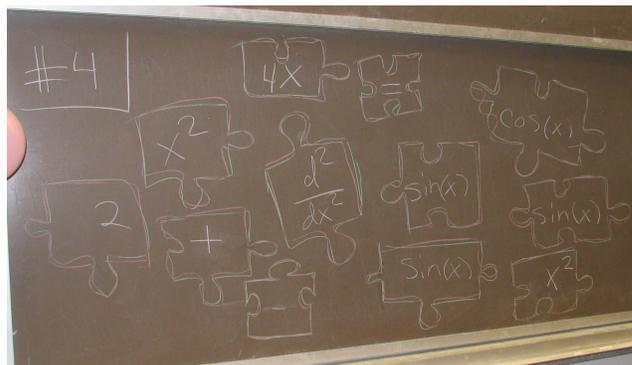
games. After collecting input from many department members, we came up with the following smorgasbord. There were three individually played games:

(1) *Pin the Nose on Isaac Newton*. At the start of the game, a calculus problem was announced (for instance, find the derivative of $f(x)=7\sin(5x)$). Each student wrote his or her answer on a cutout of Newton's nose, put on a blindfold, spun around, walked a few feet, and stuck their answer on a picture of a noseless Isaac Newton. The most anatomically correct nose with a mathematically correct answer won a sticker.



Pin the Nose on Isaac Newton (photo by Andrejs Treibergs)

(2) *Puzzler*. See the example below. How do you arrange those pieces to get a correct mathematical statement (if the shapes of pieces are irrelevant)? We had five such puzzles drawn on the board. The largest number of correct answers (with no incorrect answers) won a sticker.



Puzzler (photo by Andrejs Treibergs)

(3) *Basket Toss*. When students entered the room, we handed them each a packet of seven problems, one per page. The idea was to solve each problem, crumple up the piece of paper, and toss it into one of the recycle bins in the corner of the room. At the end of a few minutes, the facilitators picked randomly from each bin, and each correct answer won a sticker.

Then there were three team games (students were told they had ten seconds to make teams of four or five):



Pictionary (photo by Andrejs Treiberis)

(4) *Pictionary*. At the start, each team chose an “artist”. Then, at four different whiteboards, the artists simultaneously tried to get their teammates to say as many words on their list as possible, by drawing pictorial hints. Sample words included “function”, “limit”, “pi”, “Leibniz”, and “antiderivative”. The greatest number of correct answers won a sticker for each team member.

(5) *Distraction*. For this game, teams were paired up, and took turns: one team solving problems from a list (one student writing, teammates giving verbal help), the other team doing their best to throw off their opponents by singing, listing random numbers, telling jokes, etc. In each pair, the team with the most correct answers won a sticker (so half the students were winners at this booth).

(6) *Telephone*. Teams lined up in rows. The student in the front of each team solved a

problem, and handed her numerical answer to the teammate behind her, who then plugged that number into the empty space in his problem. The first team with the correct answer at the end of the line won a sticker.

We also gave one challenge problem that students could work on individually during any free time between games:

(7) *The Demoralizer*. What is the largest rectangle that can be inscribed in a 3-4-5 right triangle? Which of the two inscribed squares is bigger?

On the day of the Carnival, students arrived in droves to a math department decked out in balloons, streamers, animal crackers, and candy corn. Each student got a colored index card on the way in, as proof of attendance, and as a way to collect stickers. After a quick pep rally, we sent the students to the different booths, depending on the color of their card. They then rotated through the booths in cyclic order. Somehow, the timing of it all was magically coherent.

We had many graduate students and faculty members helping to run the games. I got to spend the evening running around the two buildings of our department, checking out all the action. I was overjoyed—and a little shocked—to see how much fun the students, as well as the faculty members, were having. For at least a couple of hours, math was cool.

After the six rounds of games, we all gathered in the same room where we started. We handed out donuts and juice, and we awarded \$25 gift certificates for most stickers in the Calculus I, Calculus II, and Beyond Calculus categories, and also for best solution to the Demoralizer.

In the end, what was most rewarding about the Calculus Carnival was that our students had real fun—not lack-of-excruciating-pain fun, but real, uncontrollable-laughter fun.

A great barrier for many Calculus students is that mathematics seems esoteric and inaccessible. While most students came to the Carnival for the extra credit, quite a few of them left with good feelings about mathematics, and that is a big first step towards eventual Calculus success.