

TAN LINE LOFTS CURVE-OUCH!

by Mullah McCoy, Armsborg the Swede & Johnny H. Waco

THIS IS THE FULL SOLUTION TO THE “FINAL EXAM” WHICH APPEARED IN THE APRIL 2002 ISSUE OF MAA’S MATH HORIZONS. A SLIGHTLY SHORTER VERSION OF THIS SOLUTION WAS PUBLISHED IN THE NOVEMBER 2002 ISSUE OF HORIZONS. BOTH OF THOSE DOCUMENTS CAN BE FOUND AT <http://www.spelman.edu/colm/maahorizons2002.html>. IT GOES WITHOUT SAYING THAT WHAT FOLLOWS WILL ONLY MAKE SENSE TO THOSE WHO HAVE THE FINAL EXAM IN FRONT OF THEM!

As noted in the inverted comment at the bottom of the page, “The title, authors’ names and everything in italics on this final exam are anagrams.” The good news is that none of these is as long or as difficult to decode as the fourteen word one beginning with *Fluxions* at the top of the page, which is actually an anagram of the above quoted sentence! We admit to receiving assistance from the *ten men vista rearranger* (The Internet Anagram Server) at <http://www.wordsmith.org/anagram/>.

Inspecting the *dead pair entity* (identity parade) it is not hard to pick out Leibnitz (the last image in the first row) and Newton (the middle one in the second row), providing a clue to the underlying theme of the entire page. The *hangable show* (whole shebang) was concocted by *Mullah McCoy* (Colm Mulcahy), using custom ordered images supplied by *men mixer got pie graph* (image morphing expert) *Armsborg the Swede* (Thomas W. Sederberg), who *reuses time/cache concept* (teaches computer science) at BYU. *Johnny H. Waco* (John H. Conway), who *attaches Thames mice* (teaches mathematics) at Princeton, calculated 3rd October, 1644, as the midpoint of the dates of birth of Leibnitz and Newton, taking calendrical irregularities of the period into consideration (see “Calendrical Conundrums,” by John H. Conway & Fred Kochman, in *Puzzlers’ Tribute: A Feast for the Mind*, edited by David Wolfe and Tom Rodgers, A.K. Peters, 2002, where such matters are discussed).

The ten images shown are stills taken from an automated morphing from a portrait (artist and date unknown) of Gottfried von Leibnitz to Enoch Seeman’s 1726 portrait of Isaac Newton (both found at <http://www-gap.dcs.st-and.ac.uk/history/>, the MacTutor History of Mathematics Archive at the University of St. Andrews, Scotland). The images were adjusted for size and aspect ratio compatibility.

The morphing was generated by Tom Sederberg, based on ideas found in “A work minimization approach to image morphing,” *The Visual Computer*, 14 (8-9), pp. 390-400, 1998, which he co-authored with Peisheng Gao. This points to the answer to the first of the six questions posed: on average it is **The Inventor of Calculus** (of which our title, *Tan Line Lofts Curve—Ouch!*, is an anagram) who is depicted here.

For the second question, note that the images can be assigned a natural ordering from One (pure Leibnitz) to Ten (pure Newton), according to their position in the morphing sequence. This suggests the order given by the captions: FRITZ (NOT VIE) BIN LOG DET; BIG FOOL (TENDER NITWIT); I, ONE INBRED TWIT, GOLF; IGNOBLE EDWIN FOIST; NIEL (DIN BEFITS) GOW; INDECENT FOB WIGS; BEN C. OGDEN-SWIFT; STOIC DEAN N. WEB; SNOW CABIN TED; A SECANT I OWN.

The third question asks the reader to explain (*not unify*) *ten chaps* (the funny captions). The basic idea is a linguistic morph—in the opposite direction—from A SECANT I OWN, a functional anagram of Isaac Newton, to FRITZ (NOT VIE) BIN LOG DET, a curious one of Gottfried von Leibnitz (considering his uncontested investigations into binary numbers, logarithms and determinants).

Note that the starting name has nine fewer letters than the ending one, and there are nine transitions to be made. Both source and target share E, I, N, N, O, T, and to effect the desired morph we need to add B, D, E, F, G, I, I, L, O, R, T, T, V and Z, while dropping A, A, C, S and W. We add and delete letters as required in strict alphabetical order, alternately (1) adding two letters while dropping one, and (2) merely adding one.

We start by adding B and D to the source, while dropping A, and then form SNOW CABIN TED from the resulting letters. Next we simply add E, to yield STOIC DEAN N. WEB, the caption of the third image in the morph from Newton to Leibnitz. Adding F and G and dropping the second A yields BEN C. OGDEN-SWIFT. For the fifth image, just add I, to get *Indecent Fob Wigs*. Now we add another I, together with L, while dropping C, and this gives rise to NIEL (DIN BEFITS) GOW. The seventh image caption, IGNOBLE EDWIN FOIST, is obtained by adding O. Next, add R and T and drop S, to get I, ONE INBRED TWIT, GOLF. Adding one more T, we arrive at *Big Fool (Tender Nitwit)*, the ninth image caption. Finally, we add V and Z and drop W and rearrange to get the desired target.

The fourth question is easy: with reference to the numerical image ordering mentioned above, the order used to display *Tom, then hotel chef* (the men of the cloth) was Eight, Five, Four, Nine, One, Seven, Six, Ten, Three and Two, which is alphabetical. All but one of the *sly animal rags* (silly anagrams) will have been identified by the end of this page/article/whatever, thus answering the fifth question. The last question (with its remaining anagram) we leave as an exercise!

Of the people who emailed solutions to *Agenda Unsharpeners* (Deanna Haunsperger), congratulations and *Zoomin' Trash* (Math Horizons) t-shirts go to *Garbled Test Arranger* and *Another Ruby Bearer* (Albert Gerard Stanger and Robert Aubrey Hearn to their respective friends).

A final note: we acknowledge that “Leibniz” is more correct than “Leibnitz”—however both spellings show up in the English speaking world.