

Permission to Add: Math-teaching Limericks

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POETRY FOLDER



Permission to Add: Math-teaching Limericks

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Throughout my years and decades of being a teacher, I have written limericks about every course I've taught, and sometimes courses I haven't taught but reviewed textbooks in (such as p -adic analysis and reverse mathematics, which asks which axiom systems are needed for given theorems). In my classes I usually simply use the limericks as handouts (and allow the students to take them into the Final, as "cheatsheets". I say it's an "open limericks exam"). Only on rare occasions do I read any of them aloud to the class or otherwise incorporate them into my lectures. (But the limerick on the General Power Rule does prevent students from making a particular common error.) Most students have appreciated the limericks (on one occasion a student helped me write one, and another Prob/Stat student gave me the title, "Permission to Add" (having asked, when I taught the Inclusion/Exclusion Rule in its simplest case— $n = 2$, no intersection—"So? We have permission to add?"). Other students, however, seem to ignore them—perhaps, for some, they merely signal something else they feel they have to do, something which adds to the stress that students already feel. One student even wrote in his teacher eval that he'd prefer not to have poetry included in the course. (Oh well.) I, of course, have very much enjoyed writing these limericks; they give me new perspective on the subject matter and at the beginning of every semester they help with lecture preparation. I'm now considering writing limericks about my own research; they might inspire the proof of that gritty little lemma, or at least its negation.

—MARION DEUTSCHE COHEN

PRE-CALCULUS

A fair maid from Indianapolis
was expert at drawing parabolas.
She extended their arms
and showed off their charms
and they looked positively fabulous.

A fair maid from North Minnesota
was drawing a steep asymptot-a.
When it got too high
she waved bye-bye
and mourned not a single iota.

A lady named Katy O'Grady
is good at converting to radi-
ans. "Simple," says she
"just take the degree
"and times it pi over 180."

Her cousin named Mary Magee
knows how to get back to degree.
"Just multiply by
"180 o'er pi.
"My cousin, I'm sure, will agree."

Our professor so mathematic
is using the formula quadratic.
She says "Oh, I see.
"It's MINUS b.
"Oh, why are these things so erratic?"

SUM OF AN INFINITE GEOMETRIC SERIES

Let a be the first to assert
let r be the ratio pert
put a on the top
let r from 1 drop -
don't worry, it won't get hurt.

MATRIX MULTIPLICATION

Just pair off each row with each column.
Take the sums of those products so solemn.
Yes, beat the odds
with those scalar prods
or whatever the devil you call 'em.

HYPERBOLIC FUNCTIONS - ARE YOU A HYPERBOLIC-AHOLIC?

Take the trig I.D.'s, all kinds
add h to those cos's and sin's.
And this derring-do
leaves them all still true
except for a few minus-signs.

PROBABILITY

$\mathbb{P}(A \cup B) = \mathbb{P}(A) + \mathbb{P}(B)$, WHEN A AND B ARE MUTUALLY EXCLUSIVE

Now, here's an essential point:
If A is from B disjoint
then to give you, I'm glad
permission to add
at the risk of seeming flamboyant.

IN GENERAL, $\mathbb{P}(A \cup B) = \mathbb{P}(A) + \mathbb{P}(B) - \mathbb{P}(AB)$

And now here's another cool fact
on which you might soon need to act:
You still, my comrade
have permission to add
and orders to also subtract.

THE EMPTY SET

Here comes null, consisting of nada
And neither your mada or fada
can fill-er it up
for lunch or for sup
not even with air or with wada.

UNIVERSAL SET

Here is one more thingamajig
That we'll need for this whole shindig.
Yup, time for big-U
too big to be true
but not too true to be big.

First, the possible values collect.
And then, to their prob;'s connect.
The grand finale:
expected val.
What else could we hope to expect?

STATISTICS

We can never exactly find μ .
That goes for approximate, too.
But the more the dissent
the more confident
we can be; that's the best we can do.

CALCULUS

We can diff any power of x .
It's risk-free in all respects.
 n can be miniscule
as an H-molecule
or as large as Tyranno Rex.

Let's make you a whiz in this biz
(in case someone pulls a pop quiz):
 n steps down two ways
for the rest of its days
and x remains right where it is.

GENERAL POWER RULE

On Dasher! On Dancer! On Prancer!
Don't forget the power in the answer.
It gives it might
and makes it right
also a little fancier.

PRODUCT RULE

Don't forget - f appears twice.
 g will behave likewise.
If you make like a dunce
and write them just once
... well, you'll get what you get for half-price.

INTEGRATION BY PARTS

"We need f and g -prime," said Mitch
"and it matters which is which".
"But not to worry,"
said his cousin Murray.
"It doesn't work out, we'll switch."

CHAIN RULE

Rinky, dinky, dinky.
 G provides the link-y.
But the x and the f
are not to be left
out unless we run out of ink-y.

An industrious lad from the near east
was summing a long Taylor series.
At the twentieth head
he just shrugged and said
"That's as far as I'm going, my dearies."

Don't forget - hafta diff twice.
It adds spice to this slice of life.
Two is more fun
than just plain ol' one
and ten-million times more precise.

CURVE-SKETCHING

We can plot and plot 'til we plotz
but we've got to plot the right spots
or those lows and those highs
could elude us like flies
likewise the flips and the flops.

There was a young man named Kareem
who explained "For a local extreme
"the tangent at a
"to rest must lay
"and we wish it the pleasant-est dream."

FORMULA FOR THE COEFFICIENT OF x -TO-THE- n IN THE POWER SERIES FOR $f(x)$

To find it is easy as pie
(especially if you try).
There's an exclamation
and a derivation
one low, the other high.

ABSTRACT ALGEBRA

AUTOMORPHISMS

Some're outer and some-re inner.
All're autom's (though it's winter).
Some turn out to be
the mere identity
but that's good when you're a beginner.

YOU KNOW HOW THAT RELIGIOUS MATHEMATICIAN KROENECKER SAID “GOD
CREATED THE INTEGERS; THE REST IS THE WORK OF MAN” - WELL...

SAID GOD TO KROENECKER

“One was good for a laugh.
“And two was a treat for my staff.
“But I’ve now got a hankerin’
“to do some tankerin’.
“I’ll start with one-and-a-half.”

“For seven long days labored I
“with integers low, then high.
“But now ‘tis day eight.
“’Tis time to create
“quotients and roots and pi.”

“Please forgive me,” said Kronecker L.
“I hope you won’t send me to hell.
“But x caught my attention
“and x led to extension”
and the rest we know only too well.

COMPLEX ANALYSIS

CAUCHY-RIEMANN CONDITIONS

Here they come, hot off the griddle
Spiffy and spicy and little.
One sports a plus
the other mi-nus
and neither sports the middle.

e -to-the- z is exotic
and it changes a sum to a product.
It has no root
but it’s kind of cute
and it’s vertically periodic.

SAID SIN AND COS

In trig and calc all through
one was the limit we knew.
But now we're set free.
Now we can be
anything we desire such as two.

*n*TH ROOTS OF UNITY

There are n of them sprawled on a wheel.
Among them at most two are real.
The others must go
half above, half below.
But they get paired off in the deal.

ABOUT $\oint_C f(x)/(z - z_0)^n$

When C 's end is at its beginnin'
ask "Is z -nought out'n or in'n?"
Draw the point, draw the curve
then stand back and observe.
If in doubt get a second opin'on.

DIFFERENTIAL EQUATIONS

A starry-eyed lad from Wisconsin
was hoping those coeff's would be constant.
But his hopes turned to hexes
at all of those x 's.
He shrugged and remarked "Stuff and nonsense".

PICARD'S SUCCESSIVE APPROXIMATIONS

Again and again and again
from $n - 1$ to n .
We get closer and closer
(If it's cos, we get cos-er)
but making no promises when.

PARTIAL DIFFERENTIAL EQUATIONS

A lad thought he'd service society
by studying math and psychiatry.
But his plans went a-ragin'
with the first wave equation
'cause he got Separation Anxiety.

Four, Fourier, Fouriest -
Isn't it just-plain glorious?
How, from sin's and cos's
we get (by osmosis)
so much, and emerge victorious.

VECTOR ANALYSIS

FORMULA FOR CURVATURE

r-dot dot r-dot-dot.
Yes, sometimes we dot a lot.
But dot-dot-dot?
Or r-quad-dot?
... Well, sometimes we do not.

HISTORY OF MATHEMATICS

"ADDING AND DOUBLING", ANCIENT EGYPT

There was a fair maid from Versailles.
They say she could not multiply.
Well, only by two.
So that's what she'd do
and that was enough to get by.

Omar Khayyam lived 'way back when.
Both poems and math were his ken.
Some say he was two.
I can't say I do.
But I wasn't there, nor then.

600 AD

All hail to those wonderful Hindus.
They knew all their sums and gozinto's
and square and cube roots
and other pursuits
and they did it all without Windows.

All hail to our friend Fibonacci.
He tinkered like ol' Liberace.
He started off slow
two one's in a row
but ended up vivo vivace.

Russell made sets seem fictitious
and Goedel made axioms suspicious
and thus did we
learn uncertainty.
I think that makes math more delicious.

ENCODING AND DECODING

Computers are in their glory
and everything's hunky dory
when the task assigned
is multiplyin'.
But factoring's a different story.

IRRATIONAL NUMBERS

A perky young damsel named Freda
was an adamant fraction-hater.
Well, for people like her
good news will occur:
The number of non-fraction's greater.

MODULAR ARITHMETIC – THE MOD SQUAD

The mod part is what we divide by.
Remainder is what we abide by.
And that quotient, poor dear
. . . well, its only career
is to be there and then go bye-bye.

TOPOLOGY

ACCUMULATION POINTS

These are points which a set seems to touch
but not, we observe, very much.
They can get just as close
as your eye or your nose
but never as close as your guts.

DEFINITION OF CONTINUITY

No epsilon-delta in this
since numbers don't even exist.
No fractions, no decimals
no Infinitesimals.
Instead we must find a new twist.

METRIC SPACES

These spaces we truly adore
'cause they provide numbers galore
for us to grab onto
whenever we want to
just like we used to before.

A fair maid named Mary Michelle
was smitten with Heine-Borel
and her fair cousin Dinah
liked Borel-Heine.
They got on exceedingly well.

CATEGORY THEORY

O hear ye, O mathematician!
let us make the momentous decision
to lose x and y
we can if we try
and still get to keep composition.

There once was a chap from Milano
who couldn't tell epi from mono.
I told him "get wize
"and just memorize"
but I'm willing to bet he's not gonna.

DUALITY

Hippity hippity hop.
Every C has its own Op.
But off C-Op-Op
both Op-s we can drop.
Yop, after one Op we can stop.

— THE LIMERICK THAT I PUT ON THE FIRST PAGE OF FINALS, SO STUDENTS
DON'T FORGET TO PUT THEIR NAMES ON THEIR PAPERS:

Your name! Your name! Your name!
Your name is the name of the game.
Please don't forget it
or I can't give you credit
and that would be quite a shame.

-- One student responded by writing her name about 20 times all over her paper.