MATH 8001

27 September 2013

Writing exams and quizzes

Name: _____

1. The velociraptor spots you 40 meters away and attacks, accelerating at 4 m/s^2 up to its top speed of 25 m/s. When it spots you, you begin to flee, quickly reaching your top speed of 6 m/s. How far can you get before you're caught and devoured?

Assignment due Friday 4 October:

Write a 20-minute quiz covering current material from your current course.

We will make available a LaTeX quiz template; put your name on the quiz and indicate what sections/material the quiz covers.

At the bottom of the quiz, write a short paragraph describing the values that your quiz is meant to reflect (or describe how the time constraint of a quiz makes it hard to fully represent your intended values).

Any issues arising in your current teaching?

Writing exams and quizzes (let us call these tests generically)

Getting started: writing a test from scratch

1. Identify the central ideas and, then, the most important tasks.
2. Write/choose candidate problems.
3. Review materials and ask, what did I miss? Choose problems to reward full participation in the class.
4. Trim back, following fine-tuning tips on next page.

Fine-tuning tips

1. Work through the exam completely. Ask someone else to work through the test.
(What is the golden ratio (not the Golden Ratio)?)
2. Don't be redundant or overly comprehensive.
3. Check that details do not distract from the concept you want to test.
4. Vary the level of problems.
5. Avoid problems that require tricks or clever observations.
6. Consider breaking long problems into steps. (pros and cons?)

Discussion and examples

McCallum's essay "Will This Be on the Exam?"

Exams reflect the values of the course and the instructor.

One of McCallum's values: Ask students to reason from graphical and numerical data.

Other values?

Can you give examples of recent quizzes (or midterms?) that either reflect or do not reflect McCallum's values?

(**Note**: This is a previous test question; it was a great problem, but a pain to grade.) Consider the curve parametrized by

$$\mathbf{x}(t) = \left(\frac{t^2}{2}, \frac{t^4}{\sqrt{8}}, \frac{t^6}{6} \right), \qquad -\infty < t < \infty$$

1. Briefly describe (in words) the behavior of the curve near $t = 0$.

2. Evaluate $\lim_{t \to 0} \mathbf{x}'(t)$ and $\lim_{t \to \infty} \mathbf{x}'(t)$. If either does not exist, explain why not.

3. Evaluate $\lim_{t \to 0} \mathbf{T}(t)$ and $\lim_{t \to \infty} \mathbf{T}(t)$. If either does not exist, explain why not.

4. Find $\mathbf{T}(1)$ and $\mathbf{N}(1)$. You do not have to find a general expression for $\mathbf{N}(t)$.

5. Parametrize the osculating plane of the curve at the point $\mathbf{x}(1)$.

10. (20 points) Show that the following series converges absolutely:

$$\sum_{n=0}^{\infty} \frac{(6n)!(13591409 + 545140134n)}{(3n)!(n!)^3(-640320)^{3n}}$$

(*Note:* It was shown in the late 1980s that this series converges to

$$\frac{426880\sqrt{10005}}{\pi}$$

and it has been used in the last two years to produce approximations of π that are accurate to ten trillion digits. You do not need to prove this fact or use it in your argument. *Tip:* the argument can be readily completed in a way that avoids arithmetic with large numbers; that is, an electronic calculating device is not needed. To save you some handwriting, let us agree that $A = 13591409$, $B = 545140134$, and $C = 640320$.)

Other philosophical issues

- multiple-choice questions?
- advance warning about format/content?
- high distribution or low distribution?
- calculator or no calculator?

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At the bottom of the quiz, write a short paragraph describing the values that your quiz is meant to reflect.

You might choose to write a quiz, if only for a thought experiment, that differs in its values from quizzes that you may write for your current course.