

MATH 1000 READING CHECK 3

MONDAY, JANUARY 22

Instructor: Alex Rice

Name:

These questions concern Chapter 2 of *How Not to Be Wrong* by Jordan Ellenberg, titled “Straight Locally, Curved Globally”.

- (1) Why were the Pythagoreans so vexed by a right triangle whose two smaller side lengths are equal to 1?
 - a) Because the length of the longer side isn't a whole number.
 - b) Because the length of the longer side is irrational, meaning it cannot be expressed as the ratio of two whole numbers.
 - c) Because such a triangle is difficult to draw.

- (2) Which describes Archimedes method for approximating the area of a circle of radius 1 (also known as π)?
 - a) We bound the area of the circle above and below by the area of polygons with more and more sides, giving us closer and closer approximations. Since polygons are made with straight lines, it is easier to compute their area.
 - b) We fill out the circle more and more precisely with smaller and smaller squares. It is easy to compute the area of squares, and then we can just count how many it takes to fill in the circle. The smaller the squares, the closer we can come to filling the circle perfectly, giving us closer and closer approximations.

- (3) Which describes the conceptual leap that Isaac Newton made in inventing calculus?
- a) He developed a way to understand curves, such as the parabolic arc of a projectile, without approximating them with straight lines.
 - b) Instead of just asserting that smaller and smaller pieces of a curve can be better and better approximated with straight lines over shorter and shorter intervals of time, he asserted that a single straight line could be used to perfectly approximate a curve at a single moment.
 - c) He developed ingenious computational techniques that greatly reduced the previously prohibitive amount of work required to approximate curves with more and more straight lines over shorter and shorter time intervals.
- (4) True or False: Using the modern, rigorous way of defining decimal expansions for real numbers, the number $0.999\dots$, where the 9's repeat forever, is not just very close to 1, it is actually EQUAL to 1.
- a) True
 - b) False
- (5) Who was Cauchy? (Alex's cat is named after him. Really.)
- a) An all-star power forward for the Portland Trail Blazers during their glory years in the late 1970s.
 - b) A French pop star with such crossover appeal that he won multiple Grammy awards in the 1990s.
 - c) A French mathematician who formalized "limits", revolutionizing our understanding and teaching of calculus.
- (6) What does Jordan say is one of the "great joys of mathematics" that he "hasn't experienced in any other sphere of mental life."
- a) The incontrovertible feeling that you've understood something the right way, all the way down to the bottom.
 - b) Memorizing the first thousand digits of π .
 - c) Boring and confusing your friends all the time.