
BAZINGA!
Maths
MATHS N PHYSICS
IIT BOMBAY

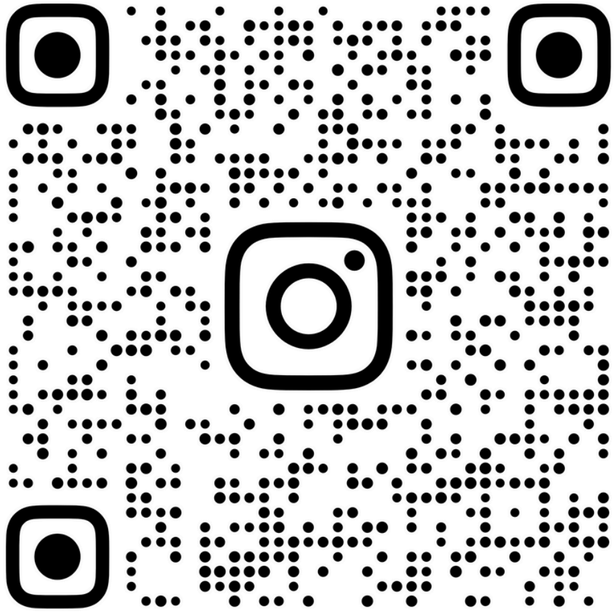
The Ultimate Maths
SHOWDOWN

Institute Technical Council

BAZINGA! Maths

~MnP Club

MATHS N PHYSICS
IIT BOMBAY



MNPCLUB.IITB

Our Insta-gram

Our Website

Preliminaries

Yass queen

Rules

- This round has 12 questions. We will cycle through them twice: for the first time, we'll be displaying the question on screen for **90 seconds** and the quizmaster will read the question aloud.

- For the second time, the question will not be read aloud and will be shown for **30 seconds** only.

- Please write down the answers to the questions on the sheet of paper given to you in the **correct order**, leaving blanks for any question you have not answered.

- Please also write your **name** and **roll number** at the top of the sheet.


Time for Bazinga bbg😘

Question 1

Find the largest closed interval over which the function

$$\sqrt{x+2\sqrt{x-1}}+\sqrt{x-2\sqrt{x-1}}$$

is constant.

SAFETY SLIDE

Question 2

After which famous Hungarian mathematician is a “collaborative distance” defined (between himself and any other person), as measured by co-authorships of scientific papers?
He is known for believing in an abstract object called “The Book”, in which he claimed God kept the best and most elegant proofs of theorems.

SAFETY SLIDE

Question 3

Find the expectation of the minimum of ‘n’ independent random variables all uniformly distributed in [0, 1].

SAFETY SLIDE

Question 4

Determine the number of functions f from the set {1, 2, 3, 4, 5} to itself such that the f(x) = f(f(x)) holds for every x in that set.

SAFETY SLIDE

Question 5

Find all triplets of integers (x, y, z) such that

$$xy(x^2 - y^2) + yz(y^2 - z^2) + zx(z^2 - x^2) = 1$$

SAFETY SLIDE

Question 6

Find all primes p, q such that

$$p^3 + 3q^3 - 32$$

is also prime.

SAFETY SLIDE

Question 7

Let n be a natural number. Put

$$x = \left(1 + \frac{1}{n}\right)^n \quad \text{and} \quad y = \left(1 + \frac{1}{n}\right)^{n+1}$$

Which is bigger: x^y or y^x ?

SAFETY SLIDE

Question 8

Find the area of the surface A∩B, where

$$A = \{(x, y, z) \in \mathbb{R}^3 \mid x^2 + y^2 \leq 4, 0 \leq z\}$$

and

$$B = \{(x, y, z) \in \mathbb{R}^3 \mid 0 \leq z = y\}$$

SAFETY SLIDE

Question 9

Find all pairs of positive integers (n, k) such that

$$n^3 - 2 = k!$$

SAFETY SLIDE

Question 10

Determine the value of

$$\int_0^{20} (x^2 - \lfloor x \rfloor \lceil x \rceil) dx$$

SAFETY SLIDE

Question 11

A certain Russian mathematician's decision regarding the first in a list of 7 was based on his belief that his contribution was lower than Richard Hamilton's, and his "disagreement with the organized mathematical community". Who am I talking about?

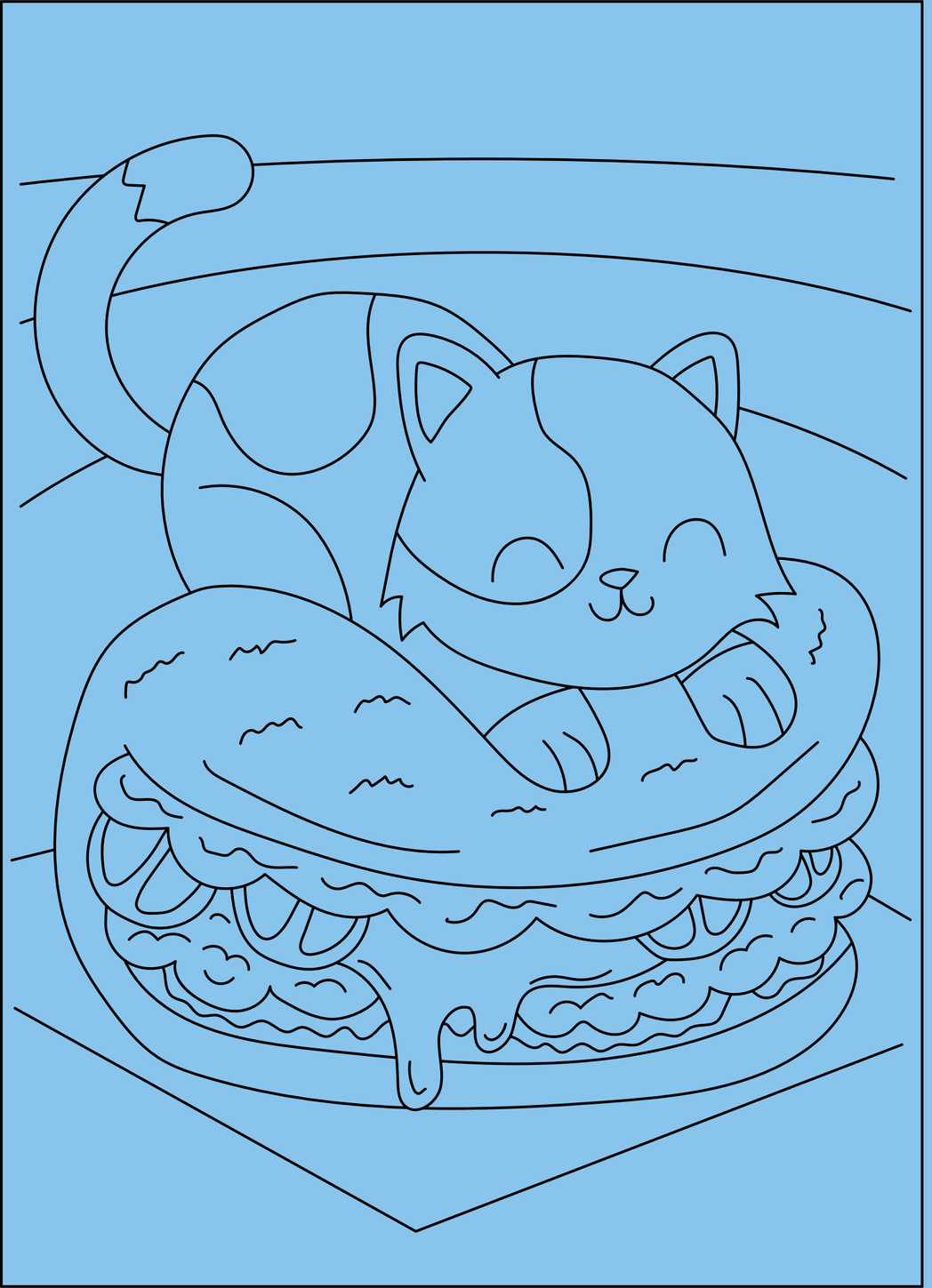
SAFETY SLIDE

Question 12

Compute

$$\int_0^\infty \frac{sin(x^3)}{x} dx$$

SAFETY SLIDE



PHEW!
breathccc

DONE AT LAST

SOLUTIONS

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[1, 2]

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Paul Erdős

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$$\frac{1}{n+1}$$

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No such triplets exist

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Both are equal

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$$2\sqrt{2}\pi$$

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(2, 3)

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$$\frac{20}{3}$$

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Grigori Perelman; he solved the Poincaré conjecture , one of the Millenium Prize problems, but refused to take the one million dollar prize.

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$$\frac{\pi}{6}$$