

Mathematics 2200H – Mathematical Reasoning

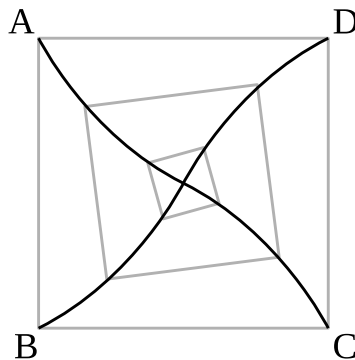
TRENT UNIVERSITY, Fall 2015

Assignment #11

Puzzle Bugs!

Due on Monday, 7 December, 2015.

Suppose four tiny bugs, A , B , C , and D , are placed at the corners of a square with sides 10 cm long. The four bugs all start moving at 1 cm/s at the same time. At each instant bug A heads directly towards bug B , bug B heads directly towards bug C , bug C heads directly towards bug D , and bug D heads directly towards bug A , until they eventually meet in the centre of the square.



1. How long is the path that each bug traverses before they all meet in the centre? Explain why as fully as you can. [10]

The Physicist's Lament

or

It All Started With Wave-Particle Duality

Extremely tiny billiard balls
Create a force on every wall,
Moving much too fast to fall:
I've looked at light that way.
But now this doesn't seem to fit,
When looking through a double slit.
And shadows blur a little bit
With this peculiar ray.

I've looked at light from both sides now,
From speck and wave, and still somehow,
It's light's illusions I recall.
I really don't know light at all.

Moving steady as can be,
With lots of simultaneity.
A smooth increase in entropy:
I've looked at time that way.
But near the speed of light, I've found,
All rates of change start slowing down,
While antimatter turns things round,

And goes the other way.
I've looked at time from both sides now,
From where and when, and still somehow,
It's just equations I recall.
I really don't know time at all.
Yellow, red, and sometimes blue,
Just u's and d's will nicely do
To give protons, and neutrons, too:
I've looked at quarks that way.
But lambdas now are acting strange.
They're taking much too long to change.
For something's lost if something's gained,
During their strong decay.
I've looked at quarks from both sides now,
From up and down, and still somehow,
It's only hadrons I recall.
I really don't know quarks at all.

Words by William Hughes; intended to be sung to the tune of Both Sides Now, by Joni Mitchell.