MATH 121
(Day 8)

More Anamorphoses
and
Projective Geometry

http://www.people.vcu.edu/~rhammack/Math121/index.html
István Orosz (1997)
István Orosz (1997)
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István Orosz
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István Orosz
István Orosz
Edgar Müller, 2008
Edgar Müller, 2008
The Mathematics of Anamorphosis

(Imagine a light source at the viewer’s eye.)
The Mathematics of Anamorphosis

Imagine a light source at the viewer’s eye.

How To Make an Anamorphosis (Top View)

transfer picture to distorted grid

viewer stands here
Kokichi Sugihara
Meiji Institute for Advanced Study of Mathematical Sciences
Meiji University, Japan
Shigeo Fukuda (1936–2009)
Shigeo Fukuda (1936–2009)
Shigeo Fukuda (1936–2009)
Shigeo Fukuda (1936–2009)
Shigeo Fukuda (1936–2009)
Shigeo Fukuda (1936–2009)
Tim Noble and Sue Webster

Real Life is Rubbish
How to Make “Shadow Images”

Wall is 10 feet from light source. To cast shadow at point \((x, y, 10)\) on wall, you need an obstruction at point \(\left(\frac{xz}{10}, \frac{yz}{10}, z\right)\) in space.
MATH 121

(Day 8)

Projective Geometry
The Idea Behind Projective Geometry
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The Euclidean Plane
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The Euclidean Plane

...add a line at infinity

The Projective Plane
The Idea Behind Projective Geometry

The Euclidean Plane

Any two points determine a line.

...add a line at infinity

The Projective Plane
The Idea Behind Projective Geometry

The Euclidean Plane

Any two points determine a line.
Any two lines determine a point,
_**unless the lines are parallel.**_
The Idea Behind Projective Geometry

The Euclidean Plane

Any two points determine a line. Any two lines determine a point, unless the lines are parallel.

The Projective Plane

...add a line at infinity

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The Idea Behind Projective Geometry

The Euclidean Plane

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Any two lines determine a point, \textit{unless the lines are parallel}.

The Projective Plane

...add a line at infinity

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Any two lines determine a point.
The Inventors of Projective Geometry

Girard Desargues
1591–1661
The Inventors of Projective Geometry

Girard Desargues
1591–1661

Blaise Pascal
1623–1662
Desargue’s Theorem:
If two triangles are in perspective...
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... then their corresponding sides, if extended, will intersect at three points that lie on a straight line.
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If two triangles are in perspective...

... then their corresponding sides, if extended, will intersect at three points that lie on a straight line.
Rough idea of proof:

It’s this diagram seen in perspective. Sets of parallel lines meet on the horizon.
Pascal’s Theorem: (The Magic Hexagram)
If a hexagon is arbitrarily inscribed in a circle (or conic), then...
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Thanks for taking MATH 121!
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Next time: Crit Day!

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