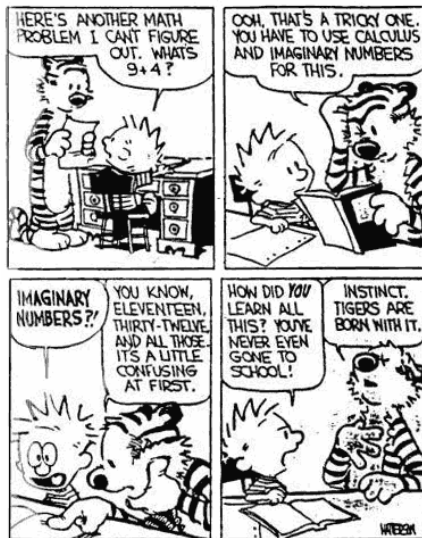


# Review for Midterm I



- ① Basic operations: vector addition, scaling, length (norm).
- ② Dot product: finding angles, perpendicularity, projections.
- ③ Cross product: calculation, finding normals, area of parallelogram, volume of parallelepiped.

# Lines and planes

- ① Lines: given a point and direction, given two points, parametric form, symmetric form.
- ② Planes: given a point and normal, given three points.
- ③ Geometric applications: test if lines are parallel/intersecting/skew, test if lines/planes intersect, find angle between lines/planes.

# Quadric surfaces

Be able to identify a quadric surface from its equation by looking at traces.

- ① Cylinder: typically missing one variable.
- ② Ellipsoid: ellipse, ellipse, ellipse.
- ③ Hyperboloid: ellipse, hyperbola, hyperbola. Can have one sheet or two.
- ④ Cone: ellipse, hyperbola, hyperbola but ellipse shrinks to a point.
- ⑤ Paraboloid: parabola, parabola, ...
  - ① hyperbolic paraboloid: ... hyperbola.
  - ② elliptic paraboloid: ... ellipse.

# Complex numbers

- ① Basic operations: addition, subtraction, multiplication, division.
- ② Cartesian and polar forms. Geometric meaning of multiplication.
- ③ Solving equations with complex numbers.
- ④ Exponentials, Euler's formula.