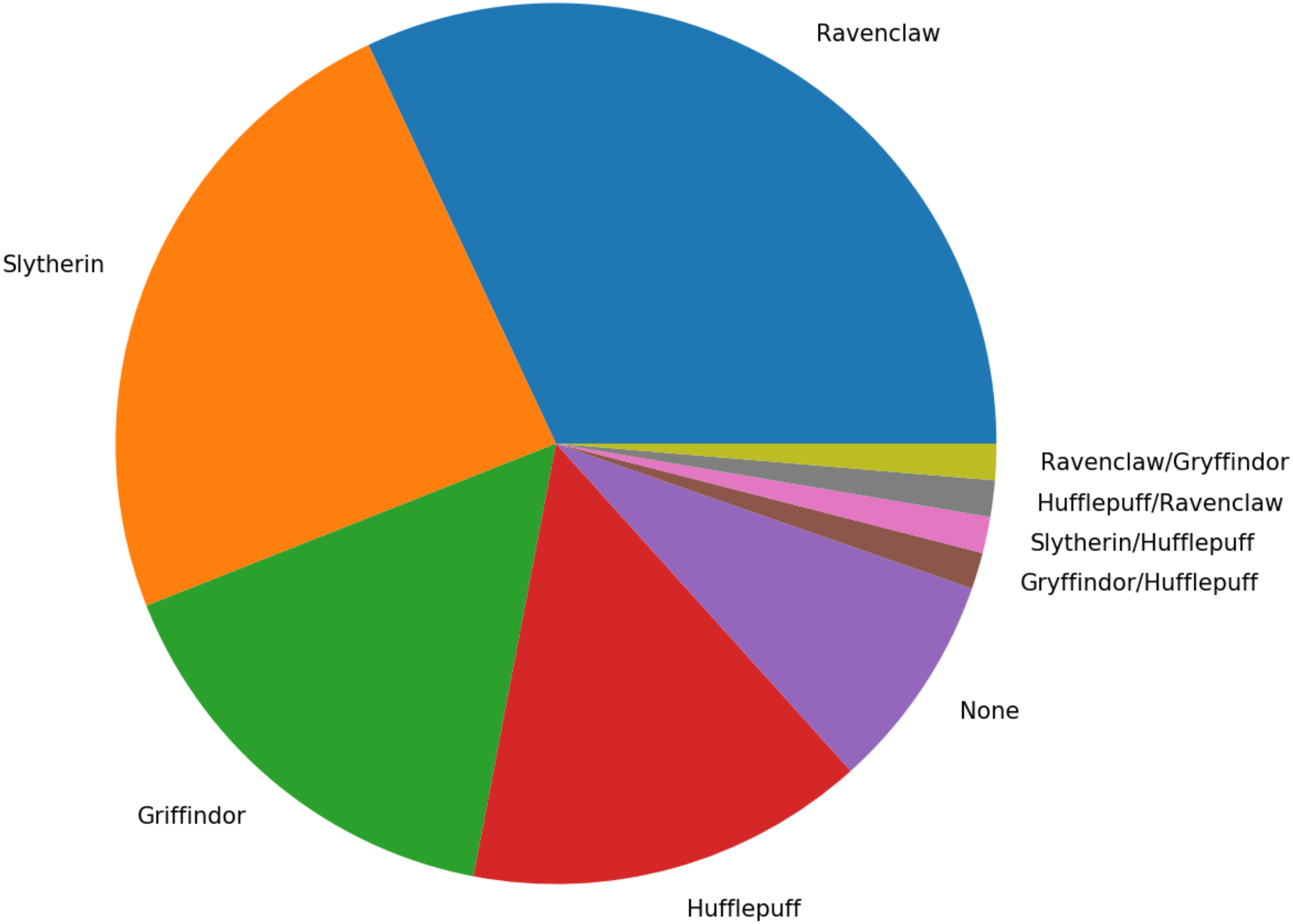
For the 1D Laplace problem ($\nabla^2 V = \partial^2 V / \partial x^2 = 0$), we can choose the following ansatz:

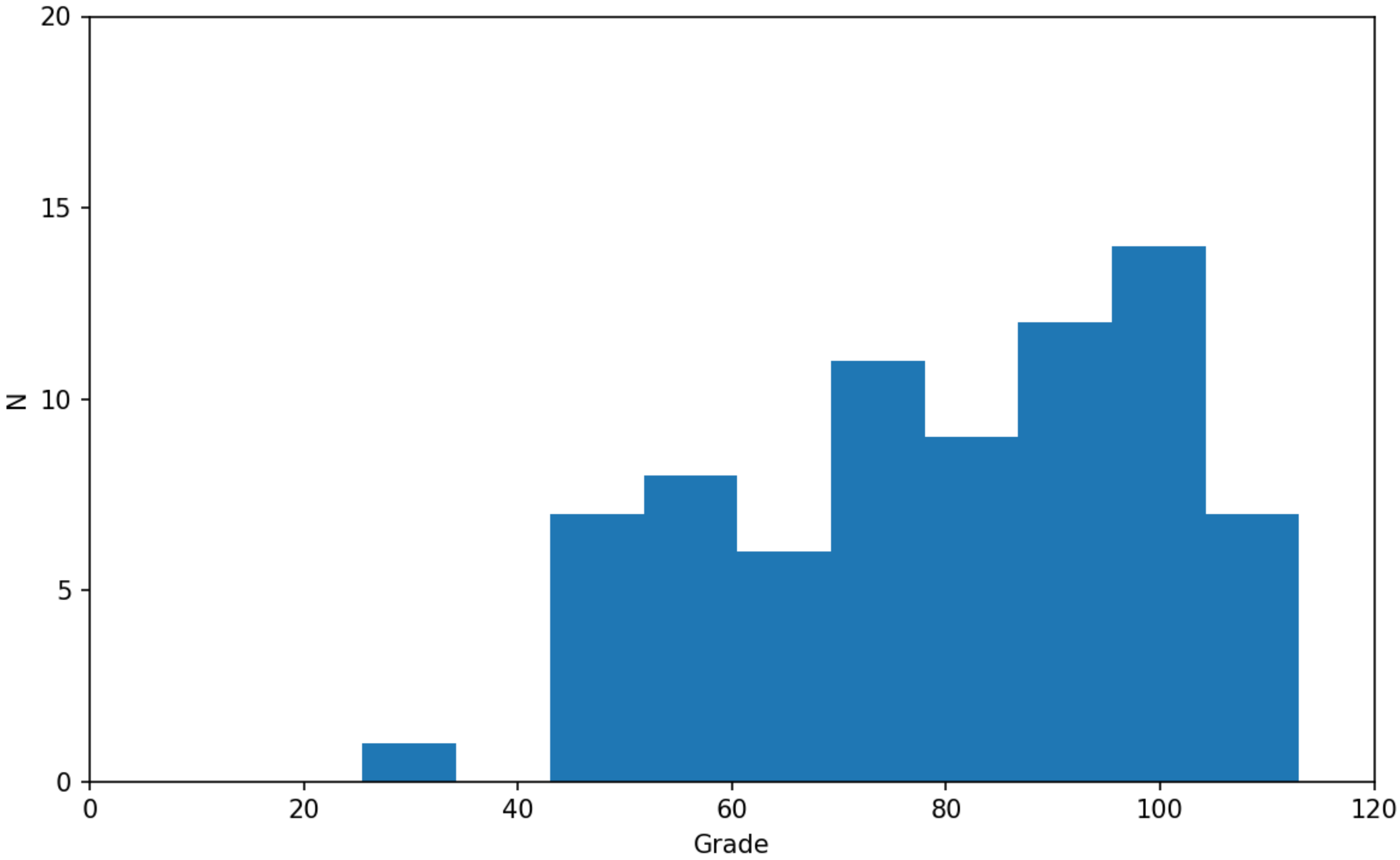
A. $k_0 \, x$
B. $k_0 \, x + k_1$
C. $k_0 \, x^2 + k_1 \, x + k_2$
D. Can't tell


Ravenclaw
Slytherin
Griffindor
Hufflepuff
None
Ravenclaw/Gryffindor
Hufflepuff/Ravenclaw
Slytherin/Hufflepuff
Gryffindor/Hufflepuff

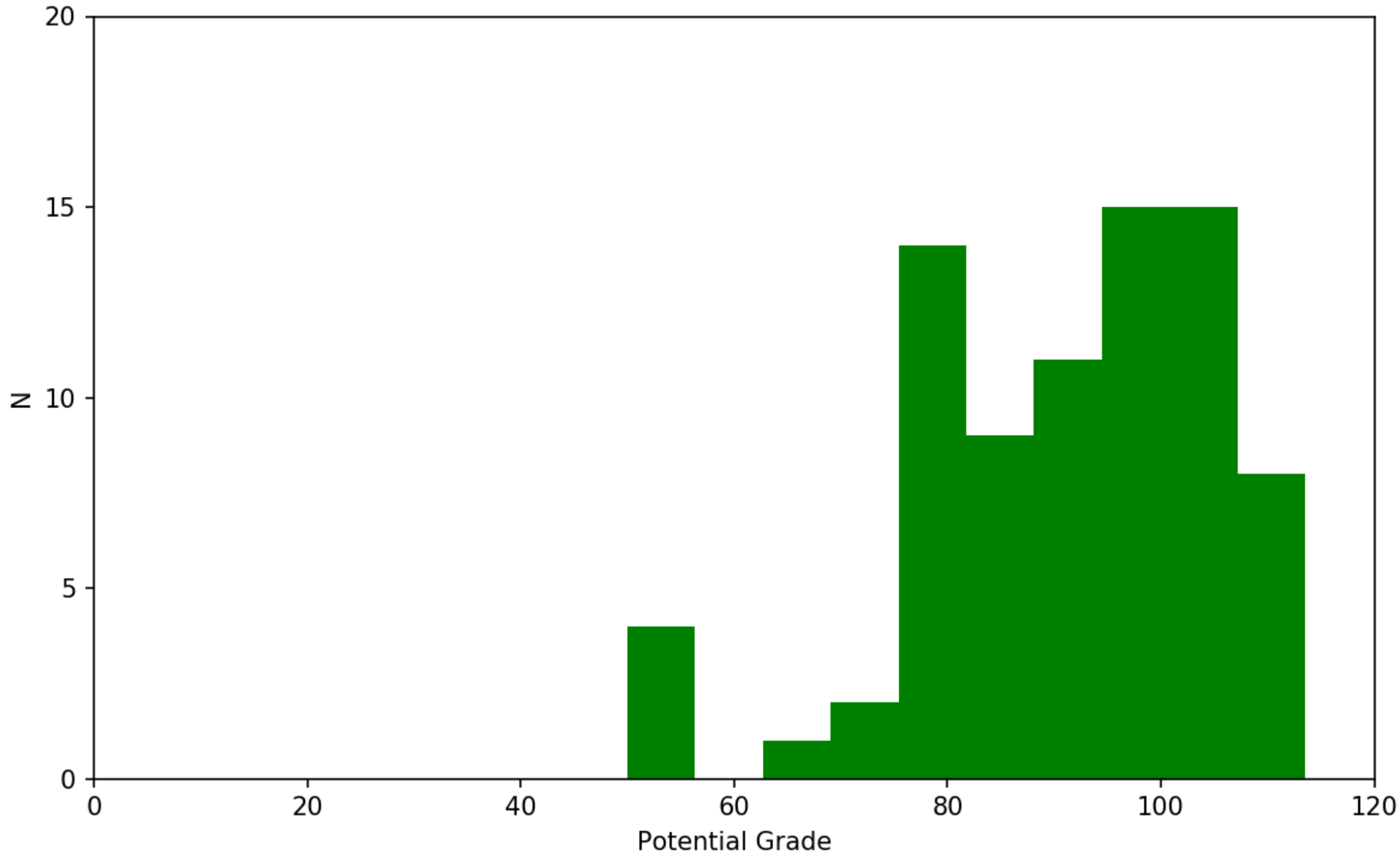
ANNOUNCEMENTS

- Exam 1 graded
  - Average: 79.5
- HW 6 Problem 1 and 2
  - On your exam, you will see the grade you will receive if you choose to do problem 1 and 2
  - You need to collect your exam to do these problems!

EXAM 1 DISTRIBUTION



EXAM 1 (RE)DISTRIBUTION*

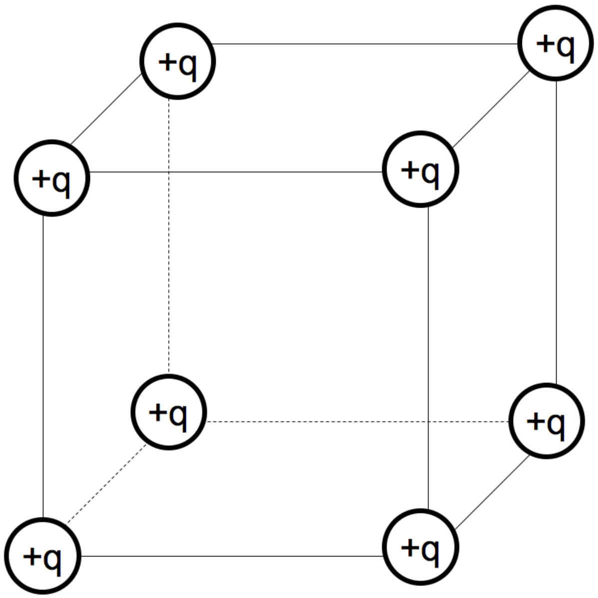


WaMPS

Physics GRE Study Sessions

ETS GRE

- **Monday, October 8**
- **4-5 pm BPS 1300**
- Physics graduate students will explain the contents of the exam, provide study and test taking strategies, go over practice problems, and answer any specific questions you may have.
- Next sessions
  - Friday 10/19 3-4 pm, BPS 1400
  - Tuesday 10/23 3-4 pm BPS 1400
- Contact Alison Peisker with any questions (peiskera@msu.edu)



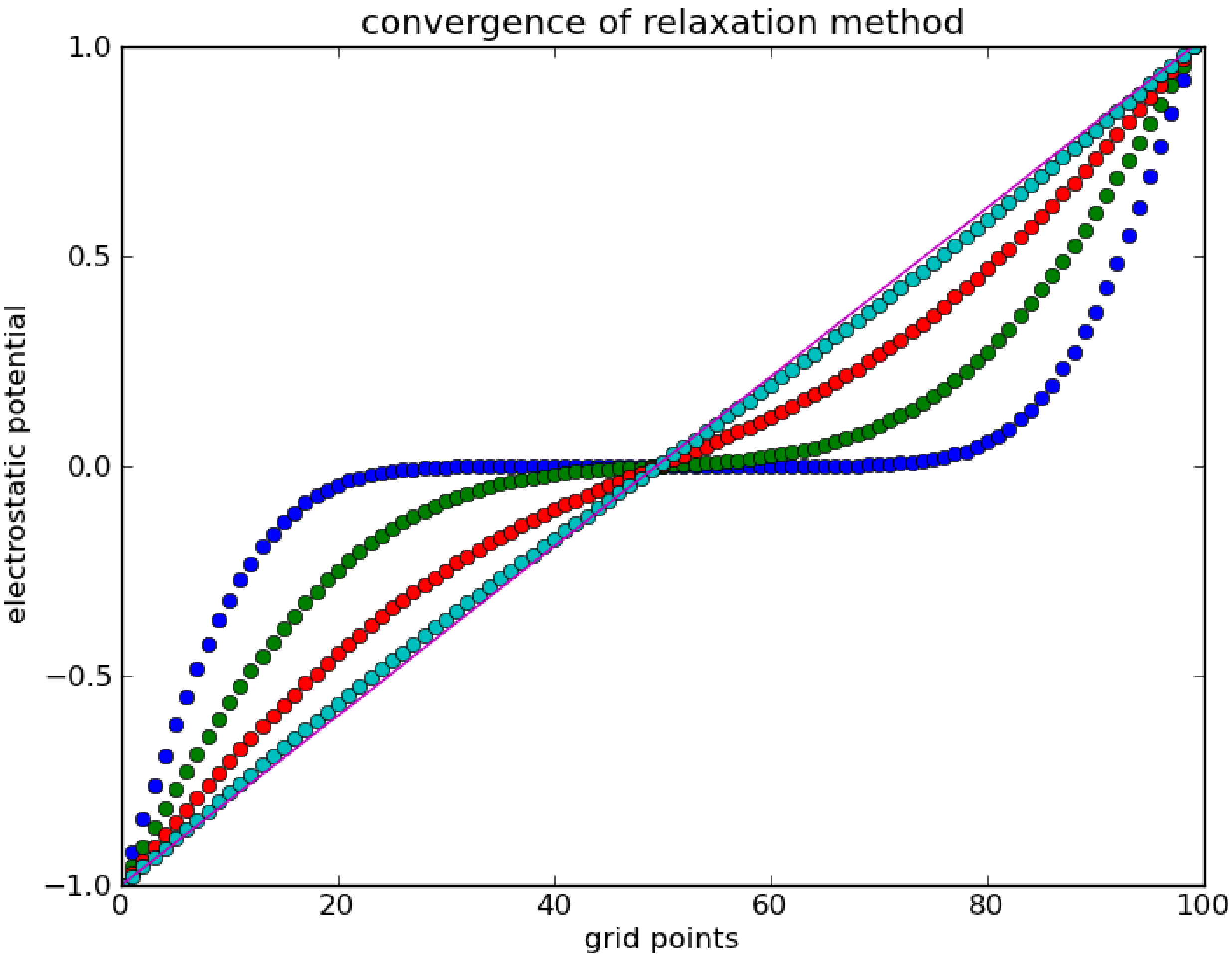
If you put a positive test charge at the center of this cube of charges, could it be in stable equilibrium?

A. Yes

B. No

C. ???

METHOD OF RELAXATION



Consider a function $f(x)$ that is both continuous and continuously differentiable over some domain. Given a step size of a, which could be an approximate derivative of this function somewhere in that domain? $df/dx \approx$

A. $f(x_i + a) - f(x_i)$
B. $f(x_i) - f(x_i - a)$
C. $\frac{f(x_i+a)-f(x_i)}{a}$
D. $\frac{f(x_i)-f(x_i-a)}{a}$
E. More than one of these

If we choose to use:

$$\frac{df}{dx} \approx \frac{f(x_i + a) - f(x_i)}{a}$$

Where are we computing the approximate derivative?

A. a
B. x_i
C. $x_i + a$
D. Somewhere else

Taking the second derivative of $f(x)$ discretely is as simple as applying the discrete definition of the derivative,

$$f''(x_i) \approx \frac{f'(x_i + a/2) - f'(x_i - a/2)}{a}$$

Derive the second derivative in terms of f.

With the approximate form of Laplace's equation:

$$\frac{V(x_i + a) - 2V(x_i) + V(x_i - a)}{a} \approx 0$$

What is a the appropriate estimate of $V(x_i)$?

A. $1/2(V(x_i + a) - V(x_i - a))$
B. $1/2(V(x_i + a) + V(x_i - a))$
C. $a/2(V(x_i + a) - V(x_i - a))$
D. $a/2(V(x_i + a) + V(x_i - a))$
E. Something else

To investigate the convergence, we must compare the estimate of V before and after each calculation. For our 1D relaxation code, V will be a 1D array. For the kth estimate, we can compare V_k against its previous value by simply taking the difference.

Store this in a variable called `err`. What is the type for `err`?

A. A single number
B. A 1D array
C. A 2D array
D. ???