# Differentiation Rules

## Activity Instructions

### Activity:

The image and activity below can be used to engage students in critical thinking and in-class discussion around a key concept that will be tested during the AP exam.

1. In small groups, have students reference the differentiation rules chart and come up with five equations with the following characteristics and write them on a sheet of paper:

   - Requires exactly one rule
   - Requires exactly two rules
   - Requires exactly three rules
   - Requires all of these rules
   - Requires at least one rule that is not on this list

2. On a separate sheet of paper, take the derivative of each equation to make an answer key (have all group members verify the work).
3. Swap equation sheets with a different group and try to differentiate theirs.
4. When both groups are done, share answer keys and discuss any discrepancies.
5. After the activity, print the differentiation rules image as a poster to hang in your classroom to reinforce the lesson.

### Possible variations:

Put numbers in front of the rules and have them roll dice to determine which rules they need to use. Present the image of the empirical rule on-screen to the class or print copies to give to each student or pairs/groups of students. **Requires an 8-sided die, the unused number could be any rule not on this list.

## Differentiation Rules

| | |
|---|---|
| Constant | $\dfrac{d}{dx}[c] = 0$ |
| Power | $\dfrac{d}{dx}[x^n] = nx^{n-1}$ |
| Natural exponential | $\dfrac{d}{dx}[e^x] = e^x$ |
| Exponential | $\dfrac{d}{dx}[a^x] = (\ln a)a^x$ |
| Natural log | $\dfrac{d}{dx}[\ln(x)] = \dfrac{1}{x}$ |
| Constant multiple | $\dfrac{d}{dx}[cf(x)] = cf'(x)$ |
| Sum and difference | $\dfrac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$ |