UWorld | COLLEGE READINESS

Lesson Activity: Differentiation Rules

AP® Calculus

Duration
Approximately 40 minutes

Materials Needed

- UWorld “Differentiation Rules” Chart:

Differentiation rules

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

(full-size included at the end of the lesson activity)

- Notebook paper and pencils
- Optional: 8-sided die for each student group

College Board® Standards

- **FUN-3:** Recognizing opportunities to apply derivative rules can simplify differentiation.
- **Skill 1.E:** Apply appropriate methematical rules or procedures, with and without technology.

Lesson Activity: Differentiation Rules

AP® Math

Activity Objectives

FUN-3.A: Calculate derivatives of familiar functions.

Activity Instructions

1. **Place** students into small groups and then ask them to produce five equations with the following characteristics, recording their work 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, **ask** students to take the derivative of each equation to make an answer key (all group members should verify the work).
3. Then, have students **swap** equation sheets with a different group and try to **differentiate** their equations.
4. When both groups are finished, **ask** students to share their answer keys and discuss any discrepanices.

Possible Variations

- Have students **swap** their equation sheets with every group in the class.
- **Place** numbers in front of the rules and have students **roll** dice to determine which rules they need to apply (using an 8-sided die—unused number can be any rule not included on the given list).
- **Make** a stipulation that one or more equations have to be rewritten before you can apply a rule (such as an x-term in a denominator or radical).

Guiding Questions

What are the rules of differentiation?

How do you know which rules to apply?

Why is differentiating with rules more efficient than using a limit?

Lesson Extension

The following UWorld's Learning Tools for AP Courses questions can be used for additional practice, a quick formative assessment, homework, or small group interventions: UWorld Question IDs 901047, 901049, 901051, 901299.

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