CALCULUS AB: 2021 AP EXAM DETAILS *AP Exam Date: Tuesday, May 4th 2021 (8 am)*

The exam is approximately three hours and 15 minutes long and has two parts — multiple choice and free response. Each section is worth 50% of the final exam grade.

Section I: Multiple Choice — 45 questions; 1 hour and 45 minutes

- **Part A** — 30 questions; 60 minutes (no calculator) - (2 mins/problem)**You WILL be rushed for time
- **Part B** — 15 questions; 45 minutes (graphing calculator permitted) - (time avg of 3 mins/problem)

Total scores on the multiple-choice section are based on the number of questions answered correctly. Points are not deducted for incorrect answers and no points are awarded for unanswered questions.

Section II: Free Response — 6 questions; 1 hour and 30 minutes

- **Part A** — 2 problems; 30 minutes (graphing calculator permitted; TI-36X Pro is **NOT** on College Board's approved list. I will not have any graphing calculators to loan to you during your AP exam.)
- **Part B** — 4 problems; 1 hour (no calculator) - YOU CAN WORK ON **PART A** DURING THIS TIME

The free response section tests your ability to solve problems using an extended chain of reasoning. During the second timed portion of the free-response section (Part B), you are permitted to continue work on problems in Part A, but you are not permitted to use a calculator during this time.

Scoring: Total: 108 points

a) Multiple choice: (54 points)
   - Correct answers * 1.2 = MC score

b) Free Response (FRQ): (54 points)
   - 6 FRQ problems, 9 points each

Curve for the AP Calculus AB Exam: *(Note: Curve changes from year to year)

AP Scores	Range of scores (% correct)	Score distribution (2012)
5	73 – 108 (68% - 100%)	24%
4	57 – 72 (52% - 67%)	17%
3	41- 56 (38% - 51%)	18%
2	31– 40 (28% - 37%)	10%
1	0 – 30 (0% - 27%)	31%

Day of Exam **Reminders Tuesday, May 4th 2021 (8am)**

*Be in main gym at 7:45: **Test**: 8am – 12pm
* Bring Graphing Calculator (charge your calculator night before and/or check batteries, bring extra)
*DO bring 2 or more NON-Mechanical #2 pencils, erasers, Black or Blue Ink Pen.
*Consider Bringing water, extra long-sleeve shirt

*ON FRQs: **Careful with Linkage Errors** (try to minimize your use of equal signs)
(Use ARROWS ON FRQs → instead of equal signs "=")
Example: Applying Avg. Value Theorem:

$$Avg\ Value = \frac{1}{b-a}\int_a^b f(x)dx$$

$$\int_0^5 f(x)dx = 30 = \frac{30}{5-0} = 6$$

"Linkage Issue: A solution presented using equal signs to connect expressions that are not equal"
*Use ARROWS on L'Hopital's Rule Problem on FRQs

AP Calculus AB Exam 2021 **Tips and Advice**

1. Answer Every Question! No penalty for wrong answer. Eliminate wrong choices, then make your best guess.
2. If you arrive at your solution without using derivative, slope, integral, or area-finding formula, then reconsider your approach to the problem. "When in doubt, take the derivative"/**Sketch a graph**/ Try to Categorize the problem.
3. Some MC questions can be answered working backwards. Plug answer choices into problems and see which answers work out
4. Since you will be rushed for time during the MC Non-Calculator portion**, search for the easier/quicker problems to do first**: Circle the difficult/lengthy problems and come back to it later. Not only do you spend your time wisely on easier problems, you also give yourself more time per problem by doing less problems. 4b) It's ok if you don't how to do a problem, but make sure you at least give yourself time to READ every problem. 4c) Keep track of your time! Start bubbling in answers with 5 minutes remaining.
5. Notation: $\frac{dy}{dx}$ mean f′(x), or first derivative $\frac{d^2y}{dx^2}$ **mean f″(x), or 2nd derivative**
6. Always **RADIAN** mode in your calculator, **NEVER IN** Degree mode
7. **FRQ portion: (only 15 mins per problem on average)**
   a. On FRQ try to **write neatly**. State answers clearly. a2) "+C" for indefinite Integrals
   b. If you make mistakes, cross out the work. Don't bother wasting time erasing. (You will plenty of space to work in your FRQ booklet. AP Readers (graders) are instructed to ignore anything crossed out.)
   c. * Include Units with your answers (if problem asks for it!) * Numerical approximation to **3 decimal places**
   d. No need to simplify answers: (for instance point slope form is just as good as slope-intercept form) f2) Show Your Work!
   e. Watch for phrases like "Justify your Answer" , "Show your analysis", "Explain your reasoning". They may want you to show work and write a sentence or two to explain. **A derivative sign line alone is never justification!**
   f. Try not to use the word "it". If you use the phrase "it is increasing" , the "it" is unclear and could refer t o a number of different things (function, derivative,) (Descriptive answer example: "the rate at which people are leaving the park is increasing by 50 people/hr^2 at t = 17 hrs)
   g. Try all sections in FRQ. If you can't do parts "a" and "b", just assume an answer as starting point to work on "c" or "d".
   h. If you get stuck on part "c", look back on "a" and "b". There is usually a common thread running through an FRQ problem.
   i. In FRQ sections, College board likes to insert concepts: **IVT**, **EVT**, **MVT, L'Hopital's Rule, FFTC, 2nd derivative test, Related Rates** into parts of a problem. **Remember FFTC: $\int_a^b f(x)dx = F(b) - F(a)$ **
   (EVT tends to show up on Antiderivative word problems, and IVT, MVT, (Rolle's) show up most often on Riemann Sums)
   j. Also, remember that **final position = initial + displacement:** x(b) = x(a) + $\int_a^b v(t)dt$
8. If you see a complex integral problem and it's non-calculator, chances are it's a U-substitution problem. Find the u-value and go from there.
9. Just because f''(x) = 0, that does not guarantee POI. (Use Concavity Sign Line, then justify with words)
10. Do not round values until the end of the problem ** **Rewrite y=$cos^3(4x)$ as $y = [\cos(4x)]^3$** in preparation of chain rule **
11. **Use ALL of the time given to you. Use extra time to:**
    a. Check answers. Did you bubble in the correct number space?
    b. Go back and try problem you skipped
    c. RE-READ FRQ questions closely again: Did you misread the problem? Are you providing information different than what question is asking for?
    d. Double-check problems (Assume you made a couple of careless mistakes. Try and catch them)
    e. Did you include units with answer?
    f. Don't forget "+C"
    g. Did you read the question correctly?
12. Know how to use fnint , nderiv, calling Vars→Y-Vars Y_1 (value), intersect feature b/t 2 curves, zeros(finding x-ints) on your calculator:
    a. nderiv (Y_1, x, x-value) b. Fnint (Y_1, x, lower bound, upper bound) c. 2nd/Trace/…**Zero / Minimum / Maximum / Intersect**
13. **Don't** Memorize Trig Integral Rules! **Do Memorize** Trig Derivative Rules: **Write down 6 trig derivative rules at top of your MC test.**
    a. For instance, since $\frac{d}{dx}cosu = -sinu * u'$ then you can determine that $\int sinudu = -cosu + C$
    b. …since $\frac{d}{dx}cscu = -\csc u \cot u * u'$ you can determine that $\int \csc u \cot u \, du = -\csc u + C$
14. If problem is ever asking for a relative maximum or a minimum, set the derivative of that function equal to zero. (find critical points, set numerator and denominator of the derivative equal to zero) . Same with POI: Find 2nd derivative, critical points, and test intervals on sign line
15. REMEMBER: **Find the maximum value** does **NOT** mean give the x-value. Maximum value means to provide the **Y-VALUE**!!
16. Local linearization or linear approximation just means to first find tangent line equation, then plug in the decimal value into the equation.
17. The night before and morning of test, be sure to look over the Summary sheets and derivative/integral rules!
18. Know how to Clear Calculator in case of unforeseen issue (not able to graph, strange behaviors): **2nd → Memory (+) → 7 → 1 → 2**
19. When applying(or approximating) a Calculus process(derivatives or integrals), **your units of measure will change!**
    Example: If $c(t)$ is rate of water added and measured in ounces/min , then $c'(t)$ will be in $\boldsymbol{ounces/min^2}$.
    $\int c(t)dt$ *will result in* $\boldsymbol{ounces}$

20. When separating variables, remember how to separate variables if the problem presented is not in terms of x and y. (For the example, group G *and* dG on left and t *and* dt on the right. (Treat G as your y-variable) $\frac{dG}{dt} = -(G-27)^{2/3}$