

AP Calculus AB Sections 4.1 – 4.3 Study Guide

Name: _____ Date: _____ Period: _____

The textbook exercises in the table and the additional problems below are to be used as an aid to your studying. The assigned problems given for homework need to be considered, as well when you are preparing for the exam. The exam will be given during a one hour class period without the aid of a calculator.

Section	Exercises
4.1	5-8; 15-34, 35-42, 55-62, 67-70
4.2	31-34
4.3	3-8, 9-12, 23-32

1. Find the general solution of the differential equation below and check the result by differentiation.

$$\frac{dQ}{ds} = 20s^4$$

2. Find the general solution of the differential equation below and check the result by differentiation.

$$\frac{dY}{dt} = \frac{4}{3}t^{\frac{1}{3}}$$

3. Find the indefinite integral and check the result by differentiation.

$$\int(-10s + 4) ds$$

4. Find the indefinite integral and check the result by differentiation.

$$\int(-15z^2 + 10z) dz$$

5. Find the indefinite integral and check the result by differentiation.

$$\int(-12u^2 + 6u - 5) du$$

6. Find the indefinite integral and check the result by differentiation.

$$\int (8t^3 - 4t + 6) dt$$

7. Find the indefinite integral and check the result by differentiation.

$$\int \frac{6t^2 + 14t - 12}{t^4} dt$$

8. Find the indefinite integral and check the result by differentiation.

$$\int 2\sin u + 6\cos u du$$

9. Find the indefinite integral and check the result by differentiation.

$$\int 11\tan^2 u + 19 du$$

10. Solve the differential equation.

$$\frac{dP}{ds} = -16s^3, \quad P(0) = -9$$

11. Solve the differential equation.

$$\frac{dY}{ds} = -40s^7, \quad Y(0) = -7.$$

12. Solve the differential equation.

$$\frac{dF}{ds} = -32s^7 - 8, \quad F(1) = -2$$

13. A ball is thrown vertically upwards from a height of 8 ft with an initial velocity of 30 ft per second.

How high will the ball go?

14. Find the limit of $s(n)$ as $n \rightarrow \infty$.

$$s(n) = \frac{2}{n^5} \left[\frac{n^2(n+1)^4}{3} \right]$$

15. Find the limit of $s(n)$ as $n \rightarrow \infty$.

$$s(n) = \frac{1}{n^3} \left[\frac{n(n+1)(6n+1)}{7} \right]$$

16. Evaluate the following definite integral by the limit definition.

$$\int_2^9 15u^2 du$$

17. Evaluate the following definite integral by the limit definition.

$$\int_{-4}^{-1} -1z^3 dz$$

18. Evaluate the following definite integral by the limit definition.

$$\int_{-2}^4 (9u^2 + 3) du$$

19. Write the following limit as a definite integral on the interval $[5, 11]$, where c_i is any point in the i th subinterval.

$$\lim_{\|\Delta x\| \rightarrow 0} \sum_{i=1}^n (4c_i + 3)\Delta x_i$$

20. Write the following limit as a definite integral on the interval $[3, 9]$, where c_i is any point in the i th subinterval.

$$\lim_{\|\Delta x\| \rightarrow 0} \sum_{i=1}^n 4c_i (3 - c_i^{-3}) \Delta x_i$$

21. Write the following limit as a definite integral on the interval $[3, 9]$, where c_i is any point in the i th subinterval.

$$\lim_{\|\Delta x\| \rightarrow 0} \sum_{i=1}^n \sqrt{-3c_i^2 + 2c_i} \Delta x_i$$

22. Sketch the region whose area is given by the definite integral and then use a geometric formula to evaluate the integral.

$$\int_2^8 5z \, dz$$

23. Sketch the region whose area is given by the definite integral and then use a geometric formula to evaluate the integral.

$$\int_4^6 (2x + 2) \, dx$$

24. Sketch the region whose area is given by the definite integral and then use a geometric formula to evaluate the integral.

$$\int_{-3}^3 (3 - |u|) \, du$$

25. Sketch the region whose area is given by the definite integral and then use a geometric formula to evaluate the integral.

$$\int_{-11}^{11} \sqrt{121 - t^2} \, dt$$

26. Sketch the region whose area is given by the definite integral and then use a geometric formula to evaluate the integral.

$$\int_{-R}^R \sqrt{R^2 - x^2} \, dx$$

Answer Key

1. $Q(s) = 4s^5 + C$
2. $Y(t) = t^{\frac{4}{3}} + C$
3. $-5s^2 + 4s + C$
4. $-5z^3 + 5z^2 + C$
5. $-4u^3 + 3u^2 - 5u + C$
6. $2t^4 - 2t^2 + 6t + C$
7. $-\frac{6}{t} - \frac{7}{t^2} + \frac{4}{t^3} + C$
8. $-2\cos u + 6\sin u + C$
9. $11\tan u + 8u + C$
10. $P(s) = -4s^4 - 9$
11. $Y(s) = -5s^8 - 7$
12. $F(s) = -4s^8 - 8s + 10$
13. 22.0625 ft
14. Unbounded
15. $\frac{6}{7}$
16. 3605
17. $\frac{255}{4}$
18. 234
19. Both B and D
20. All the above
21. $\int_3^9 \sqrt{-3x^2 + 2x} \, dx$
22. 150
23. 24
24. 9
25. $\frac{121\pi}{2}$
26. $\frac{\pi R^2}{2}$