



THE KNOX SCHOOL  
Always Toward the Light

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Summer Assignment  
AP Calculus AB/BC

**Directions:**

Complete the attached packet. The entire assignment is due on the first day of class.

SUMMER HELL PACKET!!! Have fun...?

Date \_\_\_\_\_ Period \_\_\_\_\_

**Evaluate each limit.**

1)  $\lim_{x \rightarrow 0} \frac{x^2 + 2x - 8}{x - 2}$

2)  $\lim_{x \rightarrow 0} \frac{16}{x^2 + 4}$

3)  $\lim_{x \rightarrow \infty} -\frac{3x}{\cos \frac{1}{x}}$

4)  $\lim_{x \rightarrow \infty} -3x \sin \frac{1}{x}$

**Find the intervals on which each function is continuous.**

5)  $f(x) = -x^3 + 4x^2 - 5$

6)  $f(x) = \begin{cases} -2x, & x \leq -2 \\ \frac{x}{2} + \frac{5}{2}, & x > -2 \end{cases}$

Use the definition of the derivative to find the derivative of each function with respect to  $x$ .

7)  $y = 2x^2 + x + 1$

8)  $y = -\frac{1}{x+5}$

Differentiate each function with respect to  $x$ .

9)  $y = 5x^2 + \frac{3}{5}x^{\frac{1}{5}} + x^{-5}$

10)  $y = 3x + 4x^{-2} + 4x^{-5}$

$$11) y = (-2x^3 + 1) \cdot 3x^5$$

$$12) y = 5x^3(3x^2 + 2)$$

$$13) y = \frac{5}{4x^2 - 4}$$

$$14) y = \frac{5x^5}{5x^5 + 3}$$

$$15) y = (x^2 + 4)^5$$

$$16) y = (2x - 1)^4$$

$$17) y = \sec(5x^4 - 2)^2$$

$$18) y = \cot(5x^2 + 3)^3$$

For each problem, use implicit differentiation to find  $\frac{dy}{dx}$  in terms of  $x$  and  $y$ .

19)  $-3x^2y^3 + 1 = 2x^3 + 3y^3$

20)  $-xy^2 + 3 = 4x^2 + 5x^3y^3$

**Solve each related rate problem.**

- 21) Water leaking onto a floor forms a circular pool. The radius of the pool increases at a rate of 2 cm/min. How fast is the area of the pool increasing when the radius is 5 cm?
- 22) A hypothetical square grows so that the length of its diagonals are increasing at a rate of 5 m/min. How fast is the area of the square increasing when the diagonals are 8 m each?

**Solve each optimization problem.**

23) A cryptography expert is deciphering a computer code. To do this, the expert needs to minimize the product of a positive rational number and a negative rational number, given that the positive number is exactly 8 greater than the negative number. What final product is the expert looking for?

24) A supermarket employee wants to construct an open-top box from a 10 by 16 in piece of cardboard. To do this, the employee plans to cut out squares of equal size from the four corners so the four sides can be bent upwards. What size should the squares be in order to create a box with the largest possible volume?



Evaluate each indefinite integral.

$$25) \int \frac{12x^7 + 7x^2 x^{\frac{5}{2}} - 4}{x^2} dx$$

$$26) \int \frac{4(25\sqrt[3]{x^2} + 25\sqrt[3]{x} + 9\sqrt[5]{x})}{15} dx$$

$$27) \int -50x^4 \sin(2x^5 + 3) dx$$

$$28) \int 6x^2 \csc^2(2x^3 + 1) dx$$

$$29) \int \cos x \cdot e^{-x} dx$$

$$30) \int \sin 2x \cdot e^{-2x} dx$$

For each problem, use a left-hand Riemann sum to approximate the integral based off of the values in the table.

$$31) \int_0^{13} f(x) dx$$

$x$	0	3	9	10	12	13
$f(x)$	-1	0	1	0	-1	0

$$32) \int_0^{16} f(x) dx$$

$x$	0	2	4	7	12	16
$f(x)$	-8	-9	-7	-8	-6	-4

For each problem, use a right-hand Riemann sum to approximate the integral based off of the values in the table.

$$33) \int_0^8 f(x) dx$$

$x$	0	3	4	6	8
$f(x)$	4	6	8	6	8

$$34) \int_0^9 f(x) dx$$

$x$	0	4	7	8	9
$f(x)$	6	4	6	5	4

Evaluate each definite integral.

$$35) \int_{2\sqrt{2}}^4 \frac{1}{x\sqrt{x^2-4}} dx$$

$$36) \int_{-6}^2 f(x) dx, f(x) = \begin{cases} -x^2 - 8x - 17, & x \leq -2 \\ 2x - 1, & x > -2 \end{cases}$$

$$37) \int_0^3 \frac{4x}{(x^2+3)^2} dx$$

$$38) \int_{-2}^0 -\frac{24x}{(4x^2+2)^2} dx$$

For each problem, find  $F'(x)$ .

$$39) F(x) = \int_x^{x^2} (t^2 + 8t + 18) dt$$

$$40) F(x) = \int_x^{x^2} (t^3 - 4t^2 + 7) dt$$

For each problem, find the volume of the solid that results when the region enclosed by the curves is revolved about the given axis.

41)  $x = 0$ ,  $x = \sqrt{6 - y}$ ,  $y = 2$   
Axis:  $y = 2$

42)  $x = -y^2 + 4$ ,  $x = 0$   
Axis:  $x = 0$

43)  $x = 2$ ,  $x = \sqrt{y + 1}$ ,  $y = -1$   
Axis:  $y = -1$

44)  $x = (y - 1)^2$ ,  $x = 1$ ,  $y = 1$ ,  $y = 2$   
Axis:  $y = 1$