

AP CALCULUS AB - Name: _____

Summer Work

For students to successfully complete the objectives of the AP Calculus curriculum, the student must demonstrate a high level of independence, capability, dedication, and effort. This summer packet is not intended to scare you, but is intended to help you maintain/improve your skills. This packet is a **requirement** for those entering the AP Calculus course and is **due on the first day of class**. If it is not completed on the first day of class, you should consider yourself behind not only on your class grade, but also on the concepts necessary for success in Calculus. Complete as much of this packet on your own as you can, then get together with a friend, e-mail me, or “google” the topic. You may also check out your book for the summer. Everything should be covered in the Pre-reqs chapter. **SHOW YOUR BEST WORK.**

Join the messaging system for the class (Remind101) by texting “@ochsab1819” (no quotes) to the number 81010 or on the Remind App.

You should be able to complete and understand at least **80%** of the following problems.

Requirements

The following are guidelines for completing the summer work packet...

- ✓ You must show all of your work on the packet.
- ✓ Be sure all problems are neatly organized and all writing is legible.
- ✓ In the event that you are unsure how to perform functions on your calculator, you may need to look it up online. You must be familiar with certain built-in calculator functions such as finding values, intersection points, using tables, and finding zeros of a function.
- ✓ I expect you to come in with certain understandings that are prerequisite to Calculus. A list of these topical understandings is below.

Topical understandings within summer work...

- ❖ Factoring
- ❖ Zeros/roots/x-intercepts of rational and polynomial functions
- ❖ Polynomial Long Division
- ❖ Completing the square
- ❖ Write the equation of a line
- ❖ Quadratic formula
- ❖ Unit Circle
- ❖ Composite function and notation
- ❖ Solving trigonometric equations
- ❖ Domain/Range
- ❖ Interpreting and comprehending word problems
- ❖ Graphing, simplifying, and solving equations of the following types: trigonometric, rational, piecewise, logarithmic, exponential, polynomial/power, and radical.

Finally, I suggest not waiting until the last two weeks of summer to begin on this packet. If you spread it out, you will most likely retain the information much better. Once again this is due, completed with quality, on the first day of class. It is your ticket into the class. Best of luck and if you have any questions, feel free to contact me at steven.becker@orecity.k12.or.us

1. Solve the following equations:

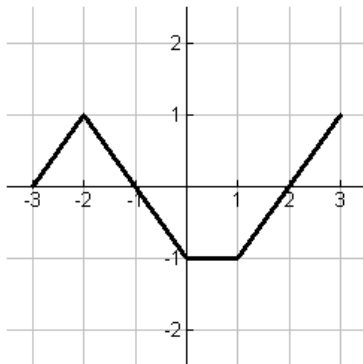
a. $2x^2 + 3x = -2x - 7$

b. $\sin(x) = \frac{\sqrt{2}}{2}$ on the interval $0 \leq x \leq 2\pi$

c. $3xy + x^2 + y^2 = 20$ Where y is exactly $\frac{1}{2}$ of x .
(you must find both the x and y value).

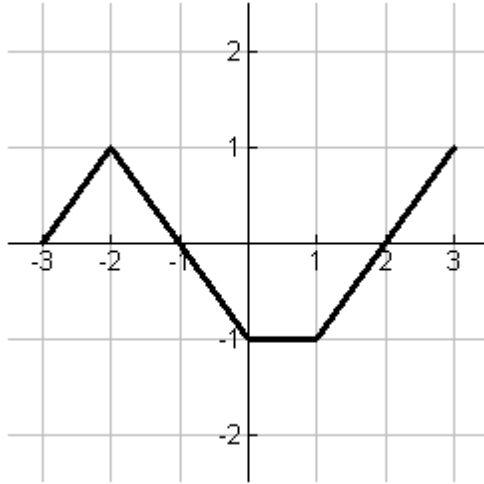
d. $\frac{\frac{2}{x+1} - 3}{x+2} = 1$

2. Using the picture below of the function f , evaluate each of the following:



- On what interval(s) is f increasing?
- On what interval(s) is f decreasing?
- On what interval(s) is f constant?

- d. On the set of axes below, sketch $f(x)+1$
 e. On the set of axes below, sketch $|f(x)|$.



3. For the function $f(x) = x^2$, write the equation for $g(x)$ where $g(x)$ is related to $f(x)$ in all the following ways:
 A shift 2 units to the right, and A shift 3 units down, and A reflection over the x-axis, and A stretch by a factor of 3.5
4. Find the value for each of the following (remember, only EXACT answers and all work must be shown – do not use your calculator)
- $\log_{10} 25 + \log_{10} 4$
 - $e^{4 \ln 2}$
5. Solve each of the following for x:
- $e^x = 3$
 - $e^{e^x} = 3$
 - $\log_3(x+1) = 2$
 - $\ln(e^{3x}) = 7$
 - $\ln(x) = 4$

6. Rationalize the numerator of $\frac{\sqrt{x-2} + \sqrt{x-4}}{x}$

7. Simplify the Difference Quotient $\frac{f(x+h) - f(x)}{h}, h \neq 0$ when $f(x) = 2x^2 - 3x + 4$.

8. Which of the following statements are true when a and b are real numbers?

I. For all positive a and b , $\sqrt{a+b} = \sqrt{a} + \sqrt{b}$

II. For all a and b , $\sqrt{(a+b)^2} = |a+b|$

III. For all positive a and b , $\frac{a-b}{\sqrt{a} + \sqrt{b}} = \sqrt{a} + \sqrt{b}$

- (A) III only (B) all of them (C) I and II only (D) II only (E) II and III only
(F) none of them (G) I and III only (H) I only

9. Given $f(x) = 3x - 2$ and $g(x) = 3x^2 - 2x$, evaluate $(f \circ g)(2)$.

10. The length L of a rectangle is twice as long as its width W . Write the area A of the rectangle as a function of its width W ?

11. Given $f(x) = -x^5 + 4$, what is the equation for $f^{-1}(x)$?

12. Write an equation of the vertical line and the horizontal line passing through the point $(7, \pi)$.

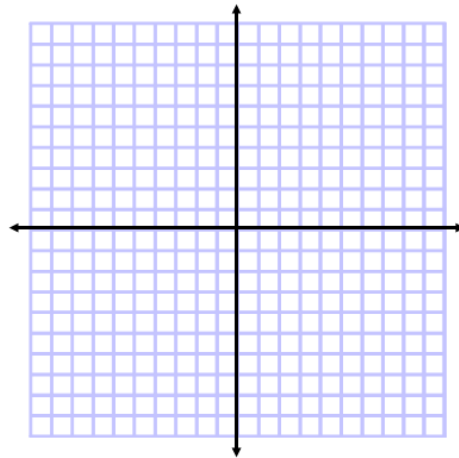
13. Write an equation of the line in **slope-intercept form** passing through the points $(3,4)$ and $(5,1)$.

14. Given the point $\left(4, \frac{1}{2}\right)$ and the line $4x + 3y = 6$ find the following:

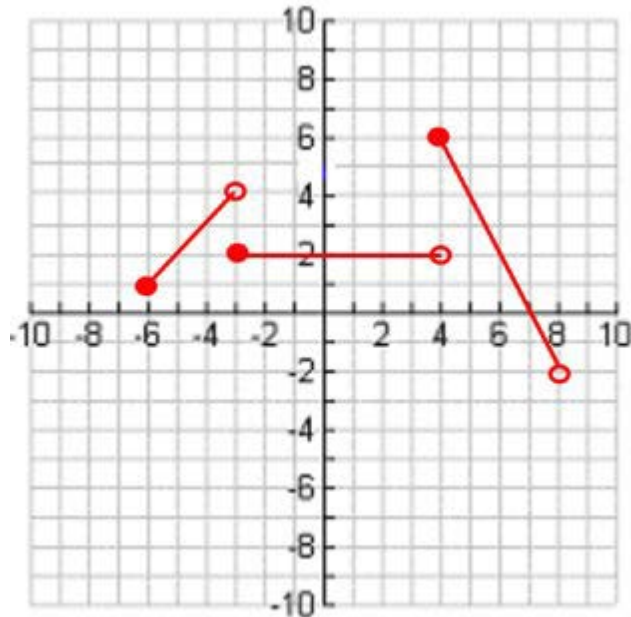
- The line the parallel to the given line and passing through the point.
- The line perpendicular to the given line and passing through the point.
- The x and y intercepts for the line you found in part (b).

15. Graph the following piecewise function:

$$h(x) = \begin{cases} t^2, & t < 0 \\ t^3, & 0 \leq t \leq 3 \\ 2t - 1, & t > 3 \end{cases}$$



16. Write a piece-wise function for the following graph.



17. The graph of $y^2 = x^2 + 9$ is symmetric to which of the following:

1. the y-axis
2. the x-axis
3. the origin

(A) I only (B) II only (C) III only (D) I and II only
(E) I and III only (F) II and III only (G) I, II, and III

18. What is the domain of $f(x) = \ln(2x - 5)$?

19. Divide $f(x) = x^3 + 2x^2 - 8x - 5$ by $x^2 + 3$. State the quotient and remainder.

20. Solve $2\sin^2 x - 3\sin x - 2 = 0$. Give answers in exact radians on the interval $0 \leq x < 2\pi$.

21. Rewrite the following as an algebraic expression (aka no trig) $\tan(\arcsin(3x))$

22. If $f(x) = 4\sin x + 6\cos(2x)$, evaluate $f\left(\frac{\pi}{6}\right)$.

23. For each of the following functions, state their Domain and Range.

a) $\ln x$ Domain_____ Range_____

b) e^x Domain_____ Range_____

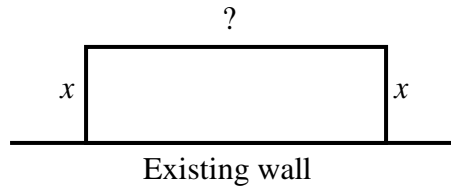
c) $\sin x$ Domain_____ Range_____

d) $\cos x$ Domain_____ Range_____

e) $\frac{3x+3}{x^2-1}$ Domain_____ Range_____

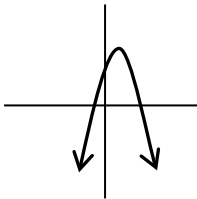
24. Simplify $\frac{\sqrt[7]{x^9}}{\sqrt[5]{x^6}}$. Express your answer using a single rational exponent.

25. Three sides of a fence and an existing wall form a rectangular enclosure. The total length of a fence used for the three sides is 240 ft. Let x be the length of two sides perpendicular to the wall as shown. Write an equation of area A of the enclosure as a function of the length x of the rectangular area as shown in the above figure. Then find value(s) of x for which the area is 5500 ft²

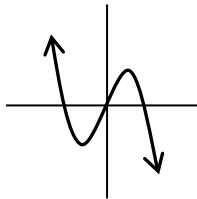


26. Which of the following could represent a complete graph of $f(x) = ax - x^3$, where a is a real number?

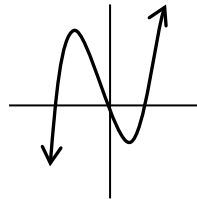
A.



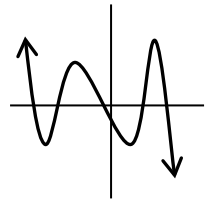
B.



C.



D.



27. The number of elk after t years in a state park is modeled by the function $P(t) = \frac{1216}{1 + 75e^{-0.03t}}$.

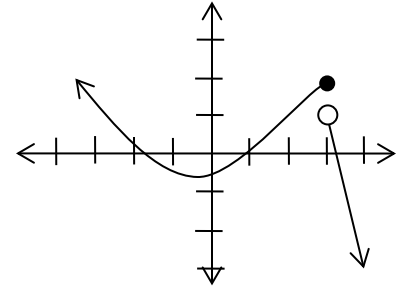
- What was the initial population of elk?
- At what time t will the number of elk be $P = 750$?
- Use your calculator to determine the maximum number of elk possible in the park?

28. Use polynomial long division to rewrite the expression $\frac{x^3 + 7x^2 + 14x - 8}{x - 4}$

29. Two students are 180 feet apart on opposite sides of a telephone pole. The angles of elevation from the students to the top of the pole are 35° and 23° . Find the height of the telephone pole.

30. For the function $f(x)$ graphed on the right answer the following (assume a scale of 1)

- A. $f(3)$ B. $f(x) = 0$
C. $f(0)$ D. $f(x) = 1$



31. Use a graphing calculator to solve the following for x . $e^{2x} = 3x^2$

32. Use a graphing calculator to approximate all of the function's real zeros. Round your results to 4 decimal places. $f(x) = 3x^6 - 5x^5 - 4x^3 + x^2 + x + 1$