

AP CALCULUS AB SUMMER ASSIGNMENT

Work these problems on notebook paper. **All work must be shown.** Use your graphing calculator only on problems 26-31 and 41-49.

Find the x - and y -intercepts and the domain and range, and sketch the graph. Determine whether each is even or odd and explain why using both graphical and algebraic evidence. No calculator.

1. $y = \sqrt{x-1}$

2. $y = \sqrt{9-x^2}$

3. $y = \frac{|x|}{x}$

4. $y = e^x$

5. $y = \ln x$

6. $y = \begin{cases} -1, & \text{if } x \leq -1 \\ 3x+2, & \text{if } |x| < 1 \\ 7-2x, & \text{if } x \geq 1 \end{cases}$

7. $y = \begin{cases} x^2+1, & \text{if } x > 0 \\ -2x+2, & \text{if } x \leq 0 \end{cases}$

Find the asymptotes (horizontal, vertical, and slant), symmetry, and intercepts, and sketch the graph. No calculator.

8. $y = \frac{1}{(x+2)^2}$

9. $y = \frac{2(x^2-9)}{x^2-4}$

10. $y = \frac{x^2-2x+4}{x-1}$

Solve. No calculator.

11. $x^2 - x - 12 > 0$

12. $\frac{(2x+5)(x-1)^2}{(x+2)^3} \geq 0$

Evaluate. No calculator.

13. $\cos \frac{5\pi}{6}$

14. $\sin \frac{3\pi}{2}$

15. $\tan \frac{5\pi}{4}$

16. $\sin \frac{7\pi}{4}$

17. $\cos \pi$

Evaluate. No calculator.

19. $\tan\left(\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right)$

20. $\sec\left(\text{Arc sin}\left(-\frac{\sqrt{2}}{2}\right)\right)$

21. $\cos(\sin^{-1}(2x))$

22. $\sec(\text{Arc tan}(4x))$

Solve. Give exact answers in radians, $0 \leq x \leq 2\pi$. No calculator.

23. $2\sin^2 x - \cos x = 1$

24. $\tan^2 x - \sec x = 1$

25. $2\sin(3x) - \sqrt{3} = 0$

Solve. Show all steps. Give the exact answer and then use your calculator, and give decimal answers correct to **three** decimal places.

26. $e^{2x} - 5e^x + 6 = 0$

27. $\frac{50}{4 + e^{2x}} = 11$

28. $\ln(5x - 1) = 3$

29. $\log_2(x + 3) + \log_2(x - 1) = \log_2 12$

30. $\log_6(\log_4(\log_2 x)) = 0$

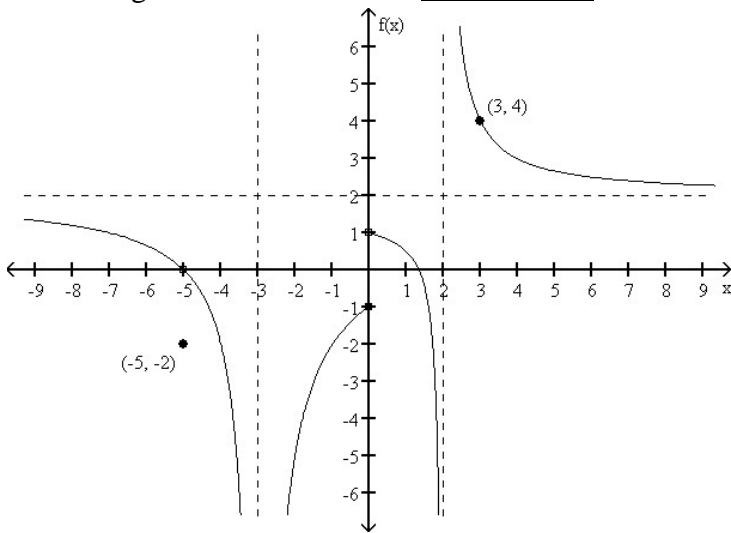
31. The number of students in a school infected with the flu t days after exposure is modeled by the function

$$P(t) = \frac{300}{1 - e^{4-t}}$$

(a) How many students were infected after three days?

(b) When will 100 students be infected?

Use the figure to find the limit. No calculator.



32. a) $\lim_{x \rightarrow 3} f(x)$ b) $\lim_{x \rightarrow \infty} f(x)$ c) $\lim_{x \rightarrow 2^+} f(x)$ d) $\lim_{x \rightarrow 0} f(x)$ e) $\lim_{x \rightarrow -\infty} f(x)$ f) $\lim_{x \rightarrow -5} f(x)$

Evaluate. Show supporting work for each problem (algebraic steps or sketch). No calculator.

33. $\lim_{x \rightarrow -3} \frac{x^2 + x - 6}{x + 3}$

34. $\lim_{x \rightarrow 0} \frac{(x - 5)^2 - 25}{x}$

35. $\lim_{x \rightarrow 0} \frac{\sqrt{x+1} - 1}{x}$

36. $\lim_{x \rightarrow 3} \frac{1}{(x - 3)^2}$

37. $\lim_{x \rightarrow 3^+} |x - 3| + 4$

38. $\lim_{x \rightarrow 3^-} \frac{|x - 3|}{x - 3}$

39. $f(x) = \begin{cases} 1 - x, & \text{if } x \leq 1 \\ x^2, & \text{if } x > 1 \end{cases}$

(a) $\lim_{x \rightarrow 1^-} f(x)$

(b) $\lim_{x \rightarrow 1^+} f(x)$

(c) $\lim_{x \rightarrow 1} f(x)$

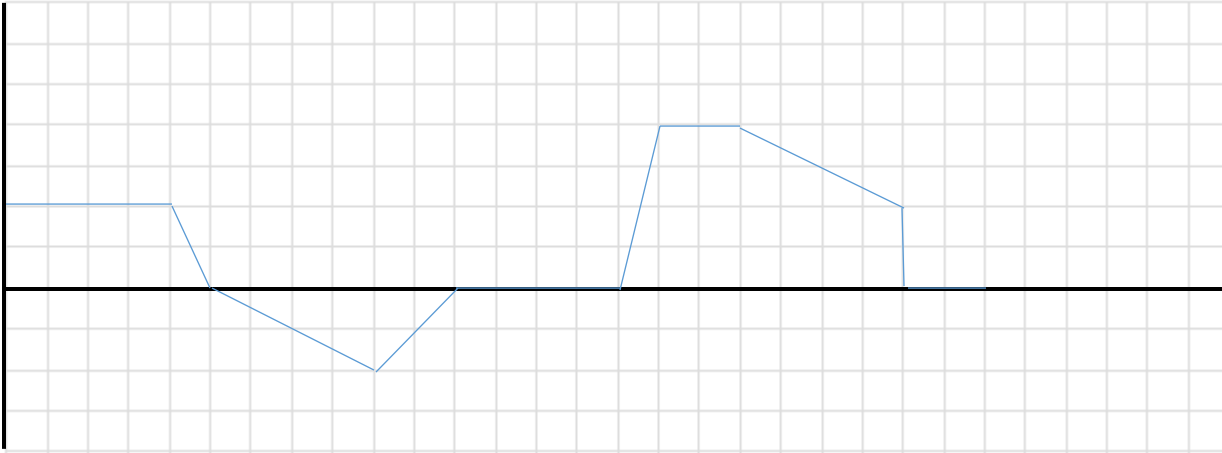
40. $f(x) = \begin{cases} \frac{x^2 - x - 6}{x - 3}, & \text{if } x \neq 3 \\ 4, & \text{if } x = 3 \end{cases}$

(a) $\lim_{x \rightarrow 3} f(x)$

(b) $f(3)$

Rates and Areas

The following graph gives the rate of rainfall (velocity) over a period of time that is collected in a basin.



Each x square is 1 hr

Each y square is .1 inch per hour

41. What does a negative rate mean?
42. How much water (position) is in the basin after 5 hours? 11 hours? 22 hours?
43. At what rate is the rate of rainfall changing (acceleration) at 21 hours?

The motion of a projectile follows the position equation $s(t) = -16t^2 + 96t + 256$

44. What is the average velocity of the projectile on the interval $[3, 7]$
45. Use the definition of the derivative to find the derivative at time $t = t_0$.
46. At what time does the projectile strike the ground?
47. What is its instantaneous velocity when it strikes the ground?
48. What is the maximum height the projectile reaches?
49. What is the instantaneous velocity at $t = 4$ seconds?