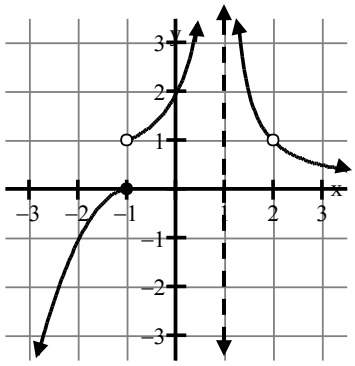
AP Calculus BC Summer Assignment

Due: Submit via file upload to Canvas by Monday, August 10, 2026 at 11:59 pm. This assignment is a quiz grade.

ALL WORK MUST BE SHOWN NEATLY ON A SEPARATE DOCUMENT. CALCULATORS MAY BE USED ONLY ON THE EXERCISES THAT REQUIRE ROUNDING.

Use the graph of $y = f(x)$ at the right for problems 1 – 3.



1) What is $\lim_{x\to 1} f(x)$?

2) What is $\lim_{x\to -1} f(x)$?

3) List all x-values where $f(x)$ is discontinuous and classify each discontinuity as removable or nonremovable.

Find the following limits

4) $\lim_{x\to 3} \frac{x-3}{x^2+9}$ **5)** $\lim_{x\to 3^-} 2[\![x]\!] + 4$ **6)** $\lim_{x\to \frac{\pi}{4}} cos(3x)$

7) If $g(x) = \begin{cases} 2x-3, & x \le -3 \\ x^2, & x > -3 \end{cases}$ **, find** $\lim_{x\to -3} g(x)$.

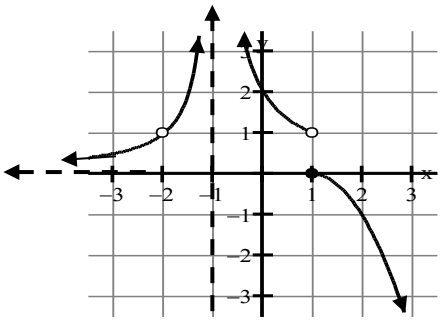
Find the following limits.

8) $\lim_{x\to 2} \frac{2x-4}{x^2-9}$ **9)** $\lim_{x\to 3} \frac{x^2-3x}{x-3}$ **10)** $\lim_{x\to 4^-} [\![x-2]\!]$

11) $\lim_{x\to -2} \frac{-3}{(x+2)^2}$ **12)** $\lim_{x\to 1} f(x), f(x) = \begin{cases} x^2-4, & x \le 1 \\ -2-x, & x > 1 \end{cases}$

13) Use the parent graph of $y = \sqrt{x}$ to graph $y = 3\sqrt{x-2}$. Accurately locate at least two points on your graph.

Use the graph of $y = f(x)$ shown for questions 14 – 16.



14) $\lim_{x\to -2} f(x)$ **15)** $\lim_{x\to 1^-} f(x)$ **16)** $\lim_{x\to -\infty} f(x)$

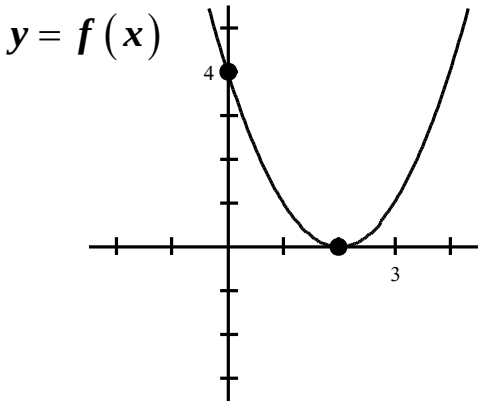
17) List the x-values of all discontinuities of f and identify which are removable and which are nonremovable.

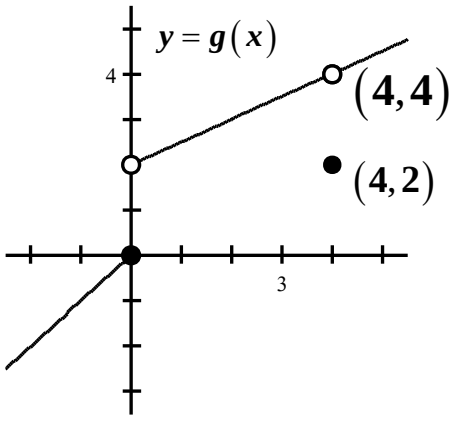
Find the following limits.

18) $\lim_{x\to \infty} \frac{(2x-1)^2}{x^2-4}$ **19)** $\lim_{x\to \frac{3\pi}{2}} \frac{csc\, x}{x}$ **20)** $\lim_{x\to \infty} \frac{2-x}{\sqrt{x^2-4}}$

21) Find the average rate of change of $f(x) = ln\, x + 2\, cos\, x$ on the interval $[2, 5]$. Show a set-up and give an answer accurate to three decimal places.

Use the two functions graphed for problems 22 – 26.





22) $\lim_{x\to 0} g(x)$ **23)** $\lim_{x\to -\infty} g(x)$ **24)** $\lim_{x\to 0^-} g(x) =$ **25)** $\lim_{x\to 0} g(f(x))$ **26)** $\lim_{x\to 2} g(f(x))$

27) If $f(x) = 3 - x^2$, use the limit definition of the derivative to find $f'(x)$. Be sure to show proper limit symbolism and show organized steps.

28) Find all *x*-values in the interval $(0, 2\pi)$ which are solutions of the equation $2\sin x + \sqrt{2} = 0$.

29) Find $\frac{d^2}{dx^2}\left(4x^{\frac{1}{2}}\right)$.

30) Find the slope of the line tangent to the graph of $f(x) = \frac{2x-4}{x}$ at the point $(4, 1)$.

31) Find the *x*-value(s) of all points where the graph of $y = x^3 - 12x$ has a horizontal tangent line.

32) Find the <u>average rate of change</u> (AROC) of $y = x^3 - 12x$ on $[0, 3]$.

33) $f(x) = \begin{cases} x^2, & x \le 3 \\ 6x - 9, & x > 3 \end{cases}$ **Find $f'(3)$.**

34) $f(x) = \begin{cases} x^2, & x \le 3 \\ 6x - 8, & x > 3 \end{cases}$ **Find $f'(3)$.**

35) $f(x) = \begin{cases} x^2, & x \le 3 \\ 7x - 12, & x > 3 \end{cases}$ **Find $f'(3)$.**

36) Given the position function of a particle moving on a horizontal line is $s(t) = t^3 - t - 30$.

- **a) Find the velocity equation for the particle.**
- **b) Find the velocity of the particle at time *t* = 3.**
- **c) Find the position of the particle at time *t* = 3.**
- **d) Is the particle moving <u>left</u> or <u>right</u> at time *t* = 3?**

For #37 and #38, given the velocity equation of a particle is $v(t) = \frac{t^2-3}{t}$ where distance is measured in feet and time is measured in seconds.

37) Find the acceleration of the particle at time *t* = 1. Be sure to label units.
38) Find the speed of the particle at time *t* = 1. Be sure to label units.

Simplify

39) $e^{3\ln x}$ **40)** $\log_{\frac{1}{2}} 1$ **41)** $\ln\sqrt{e}$

Differentiate

42) $y = 3\ln x$ **43)** $f(x) = 4\sin x - 5\cos x$ **44)** $y = x^e - e^x$

45) $g(x) = 4x^5 + \sqrt[3]{8x} + 3\cos x$ **46)** $y = x^2\sqrt{x}$ **47)** $g(t) = \frac{t-4}{2}$

48) $h(x) = \frac{x^2}{2x+3}$ **49)** $y = \frac{1}{2}\tan\theta$ **50)** $y = x\cos x - \sin x$

51) $f(x) = x^2 g(x)$

52) Find $f'(5)$ using the function from problem 51 if $g(5) = 3$ and $g'(5) = -2$.

Differentiate the following. Simplify when possible.

53) $f(x) = \frac{2x+3}{x-2}$ **54)** $y = x^2(2x+5)^4$ **55)** $y = \sin(7x^3)$

56) $y = 7\sin^3 x$ **57)** $y = e^{-2x}$ **58)** $y = 3^{-2x}$ **59)** $y = x^2 e^{-x}$

60) $y = \frac{e^x - x}{e^x + x^2}$ **61)** $y = \ln(3x^3 - x^2)$ **62)** $f(x) = \log_4(x+3)^2$ **63)** $g(x) = \cos(\ln|x|)$

Simplify by integrating

64) $\int\left(3x + \sqrt{x}\right)dx$ **65)** $\int x(x-1)^2\,dx$ **66)** $\int\left(\frac{1}{x^2} - 4\right)dx$ **67)** $\int\frac{x^3 - x^2 + 2}{x^2}dx$

68) If $f'(x) = 3x^2 + x$ and $f(1) = 5$, find $f(x)$.

Integrate

69) $\int \sin\theta\,d\theta$ **70)** $\int \sin^4 x\cos x\,dx$ **71)** $\int \tan^2 x\sec^2 x\,dx$ **72)** $\int x\cos(x^2)dx$

A particle is moving horizontally with velocity given by the equation $v(t) = t^3 - 8$. Its position at time 2 seconds is 3 centimeters, $x(2) = 3$.

73) Find the equation for the particle's acceleration, $a(t)$.
74) Find the particle's acceleration at time 3 seconds. Be sure to label units.
75) When is the particle at rest?
76) What is the speed of the particle at time zero? Be sure to label units.
77) Find the equation for the particle's position, $x(t)$.