

- (1) (Exponentials and Logarithms) Solve each of the following equations for the exact value(s) of x . You must show all work to receive credit.

(a) $4^x - 2^x - 12 = 0$

(b) $\ln(x) + \ln(x - 2) = \ln(x + 4)$

- (2) (Page 28, Problem 48) Air pressure, P , decreases exponentially with the height, h , in meters above the surface of the earth:

$$P = P_0 e^{-0.00012h},$$

where P_0 is the air pressure at sea level.

- (a) At the top of Mount McKinley, height 6198 meters, what is the air pressure as a percent of the pressure at sea level?
(b) At what height will the air pressure be 24% of the air pressure at sea-level?

- (3) (Page 76, Problem 1) Make a table of values of $f(x) = e^{2x-2}$ near $x = 1$ and use it to estimate

$$\lim_{x \rightarrow 1} \frac{e^{2x-2} - 1}{x - 1}.$$

(Round to four decimal places.)

- (4) (Page 69; Problems 37–41) In each of the following cases, find the value of k such that the limit exists. Evaluate the limit for that value of k .

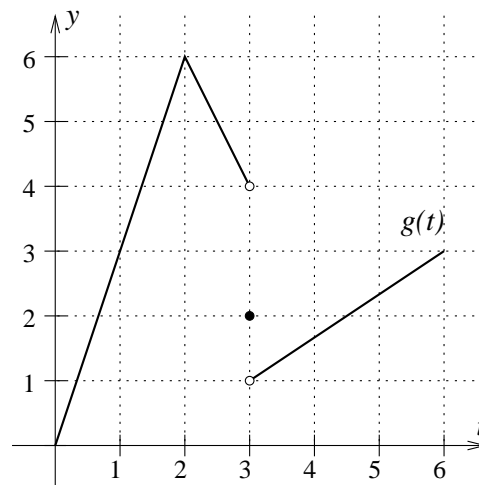
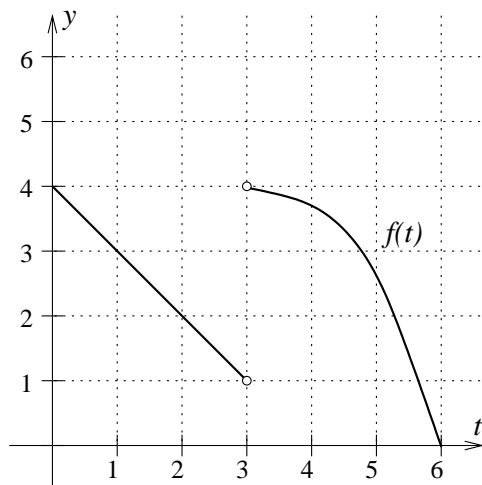
Show your work.

(a) $\lim_{x \rightarrow -1} \frac{x^2 - kx + 2}{x + 1}$

(b) $\lim_{x \rightarrow 0} \frac{e^{2x} + e^x - k}{e^x - 1}$

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- (5) (Page 68, Problem 2) Using the graphs of f and g , evaluate each limit, or write DNE if it is undefined. You do not need to show your work.



(a) $\lim_{t \rightarrow 2} \frac{f(t) - 1}{g(t) + 1} = \underline{\hspace{2cm}}$

(b) $\lim_{t \rightarrow 2} \frac{f(t - 1)}{g(t + 1)} = \underline{\hspace{2cm}}$

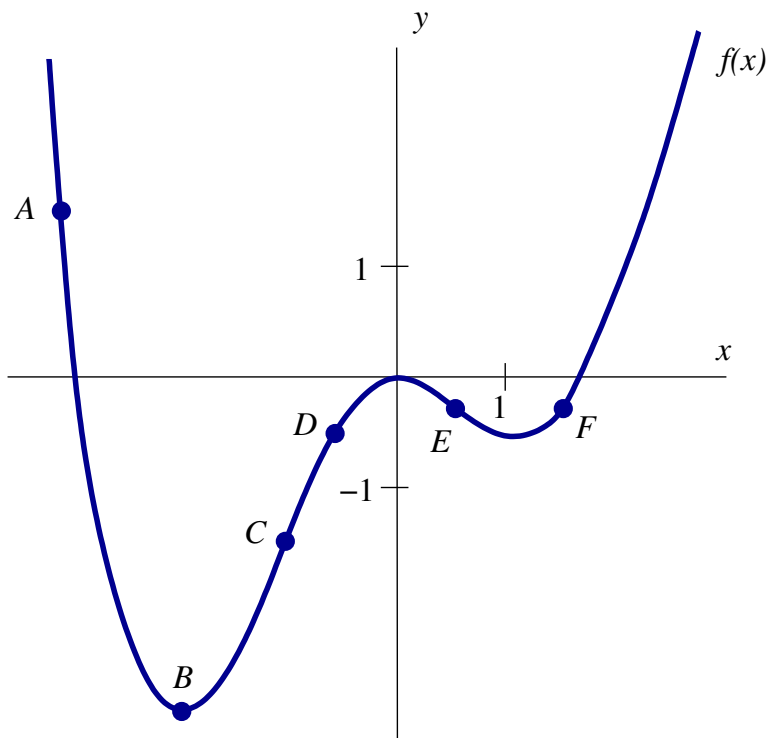
(c) $\lim_{t \rightarrow 3} [f(t) + g(t)] = \underline{\hspace{2cm}}$

(d) $\lim_{t \rightarrow 3} \left| f(t) - \frac{5}{4} g(3) \right| = \underline{\hspace{2cm}}$

(e) $\lim_{t \rightarrow 2} [f'(t)g(t) + g'(2t)] = \underline{\hspace{2cm}}$

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- (6) (Page 76, Problem 8) For each of the following sentence, select from the labeled points A – F the one/ones which completes/complete it. There may be more than one point for each description. You do not have to show your work.



- (a) The point(s) on the curve where the slope of the tangent line is positive is (are) _____.
- (b) The point(s) on the curve where the slope of the tangent line is less than -1 is (are) _____.
- (c) The point(s) on the curve where both f and f' are negative is (are) _____.
- (d) The point on the curve where the derivative of f is the greatest is _____.
- (e) Two points on the curve where the derivative is about the same are _____.

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- (7) (Page 66, Example 4) Let

$$f(x) = (x + |x - 2|)^2.$$

Evaluate each of the following expressions, or write DNE if it is not defined. Show your work.

(a) $\lim_{x \rightarrow 2^-} \frac{f(x) - f(2)}{x - 2} =$

(b) $\lim_{h \rightarrow 0^+} \frac{f(2 + h) - f(2)}{h} =$

- (8) (Page 77, Problems 21–22) Let f be a concave up function whose derivative exists for all x . The tangent line to the graph of f , at $x = 2$, has the equation

$$2y = x + 4.$$

Fill in the blanks. You do not need to show your work.

(a) $f'(2) =$ _____

(b) $f(2) =$ _____

(c) Using a linear approximation, an estimate of $f(1.9)$ is _____.

(d) The tangent line approximation of $f(1.9)$ is an _____.
(*underestimate or overestimate*)

- (9) (Page 76, Problems 16–19) Find an equation of the line tangent to the graph of the function

$$f(x) = \sqrt{\frac{a}{x}},$$

at $x = a$. Here a is some constant. You must show all your work.

- (10) (Page 100, Problem 21) Let f be a continuous function whose derivative exists for all values, and $f(2) = 3$, $f'(2) = 4$.

Fill in the blanks. You do not need to justify your answer.

(a) If f is an odd function, then $f'(-2) =$ _____.

(b) If f is an odd function, by the tangent line approximation $f(-1.9) \approx$ _____.

(c) If f is a linear function, then $f(x) =$ _____.

(d) If $f(x) = ax^{2b}$, where a and b are positive integers, then $f'(-2) =$ _____.

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Formulas you might find useful

- The derivative of a function

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

- $\frac{d}{dx} x^n = nx^{n-1}$
- $\frac{d}{dx} e^x = e^x$