

Practice Problems

(Free response practice problems are indicated by “FR Practice”)

1. Evaluate

a. $\lim_{x \rightarrow 3} \sqrt{2x + 7} =$

b. $\lim_{x \rightarrow -2} (2x^3 - x^2 + 3x - 1) =$

c. $\lim_{x \rightarrow 1} \frac{2x-3}{x^2-2x-3} =$

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

e. $\lim_{x \rightarrow 1} \frac{2x-2}{x^2+2x-3} =$

f. $\lim_{x \rightarrow 1} \frac{x^2-2x-3}{2x-3} =$

g. $\lim_{x \rightarrow 1} \frac{|x+3|}{x^2+2x-3} =$

h. $\lim_{x \rightarrow -3} \frac{|x+3|}{x^2+2x-3} =$

2. Evaluate

a. $\lim_{x \rightarrow 2} \frac{x+4}{x^2+3x-4} =$

b. $\lim_{x \rightarrow 1} \frac{x+4}{x^2+3x-4} =$

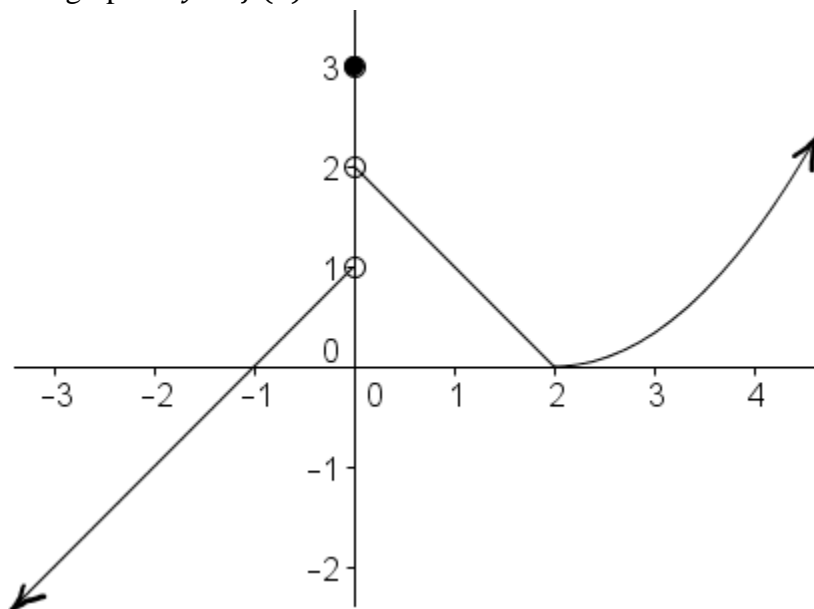
c. $\lim_{x \rightarrow -4} \frac{x+4}{x^2+3x-4} =$

d. $\lim_{x \rightarrow -\infty} \frac{3x^2+2}{x-2x^2-1} =$

e. $\lim_{x \rightarrow \infty} \frac{3x^2+2}{x-2x^3-1} =$

f. $\lim_{x \rightarrow -\infty} \frac{3x^3+2}{x-2x^2-1} =$

3. The graph of $y = f(x)$ is shown below.



a. $\lim_{x \rightarrow 0^-} f(x) =$

b. $\lim_{x \rightarrow 0^+} f(x) =$

c. $\lim_{x \rightarrow 0} f(x) =$

d. $\lim_{x \rightarrow 2^-} f(x) =$

e. $\lim_{x \rightarrow 2^+} f(x) =$

f. $\lim_{x \rightarrow 2} f(x) =$

g. Give the interval(s) on which f is continuous, and classify any discontinuities of f .

4. $g(x) = \begin{cases} 2x - 1, & x < 2 \\ 3, & x = 2 \\ 4 - 2x, & x > 2 \end{cases}$

a. $\lim_{x \rightarrow 2^-} g(x) =$

b. $\lim_{x \rightarrow 2^+} g(x) =$

c. $\lim_{x \rightarrow 2} g(x) =$

d. Give the interval(s) on which g is continuous, and classify any discontinuities of g .

5. Evaluate

- a. $\lim_{x \rightarrow \infty} \frac{x-2^x}{2x^3+2^x} =$
- b. $\lim_{x \rightarrow -\infty} \frac{x-2^x}{2x^3+2^x} =$
- c. $\lim_{n \rightarrow \infty} \frac{12n^4+3n+1}{n^3+2^n} =$
- d. $\lim_{k \rightarrow \infty} \frac{\ln(12k^4+3k+1)}{\sqrt{k}} =$
- e. $\lim_{k \rightarrow \infty} \frac{2k^{10}+3^k}{4k^5-3^k} =$

6. Evaluate

- a. $\lim_{x \rightarrow 0} \frac{\sin(x)}{2x} =$
- b. $\lim_{x \rightarrow 0} \frac{3x}{\tan(2x)} =$
- c. $\lim_{t \rightarrow 0} \frac{1-\cos(t)}{t} =$
- d. $\lim_{x \rightarrow 0} \frac{1-\cos(x)}{2x^2} =$
- e. $\lim_{u \rightarrow 0} \frac{3}{u \csc(2u)} =$
- f. $\lim_{x \rightarrow 0} \frac{1-\cos(x)}{\sin^2(2x)} =$
- g. $\lim_{x \rightarrow 1} \frac{\sin(\pi x)}{x-1} =$

7. Evaluate

- a. $\lim_{x \rightarrow 0} \left(\frac{1}{x} - \frac{2}{x^2} \right) =$
- b. $\lim_{x \rightarrow 0} \frac{\sqrt{3+x}-\sqrt{3}}{x} =$
- c. $\lim_{x \rightarrow 9^-} \frac{x-9}{\sqrt{x}-3} =$
- d. $\lim_{x \rightarrow 9^+} \frac{x-9}{\sqrt{x}-3} =$
- e. $\lim_{x \rightarrow 9} \frac{x-9}{\sqrt{x}-3} =$

8. Give the interval(s) of continuity for the function $R(x) = \frac{x+4}{x^2+3x-4}$, and classify any discontinuities of R .

9. Give the interval(s) of continuity for the function $F(x) = \frac{|x+3|}{x^2+2x-3}$, and classify any discontinuities of F .

$$10. g(x) = \begin{cases} ax - 1, & x < 2 \\ 3, & x = 2 \\ 4 - bx, & x > 2 \end{cases}$$

Give values for a and b so that g is a continuous function.

11. Determine whether the intermediate value theorem can be used to prove the following equations have solutions on the given interval.

a. $3x^3 - 10x + 1 = 0$, on $[0,1]$.

b. $3x^3 - 5x + \ln(x) = 0$, on $[1,2]$.

c. $\frac{3x^3-10x+1}{x-4} = 0$, on $[2,5]$.

$$12. g(x) = \begin{cases} \frac{|x-1|}{x-1}, & x < 1 \\ a, & x = 1 \\ 4 - bx, & x > 1 \end{cases}$$

Give values of a and b so that g is continuous.

13. (FR Practice) $f(x) = \frac{\sin(\pi x)}{x(x+1)}$

a. Determine the intervals of continuity of f .

b. Classify any discontinuities of f .

c. Determine any horizontal asymptotes of f .

14. (FR Practice) Give complete responses.

a. State the intermediate value theorem.

b. Suppose f is a continuous function on the interval (a, b) , and $f(x) \neq 0$ for all $a < x < b$. Show that f is either strictly positive on the entire interval (a, b) , or strictly negative on the entire interval (a, b) .

c. Use part b determine the intervals on which $f(x) = \frac{x^2+3x-4}{x^2-3x-4}$ is nonnegative.

15. (FR Practice) **You are permitted to use a graphing calculator on this problem.**

$$f(x) = \frac{4x - e^x}{x^2 - 2e^x}$$

- a. Give the domain of f .
- b. Find and classify any discontinuities of f .
- c. Solve the inequality $f(x) < 0$.
- d. Give any horizontal or vertical asymptotes for the graph of f .