Practice Problems

(Free response practice problems are indicated by "FR Practice")

1. Evaluate

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

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

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

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

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

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

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

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

2. Evaluate

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

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

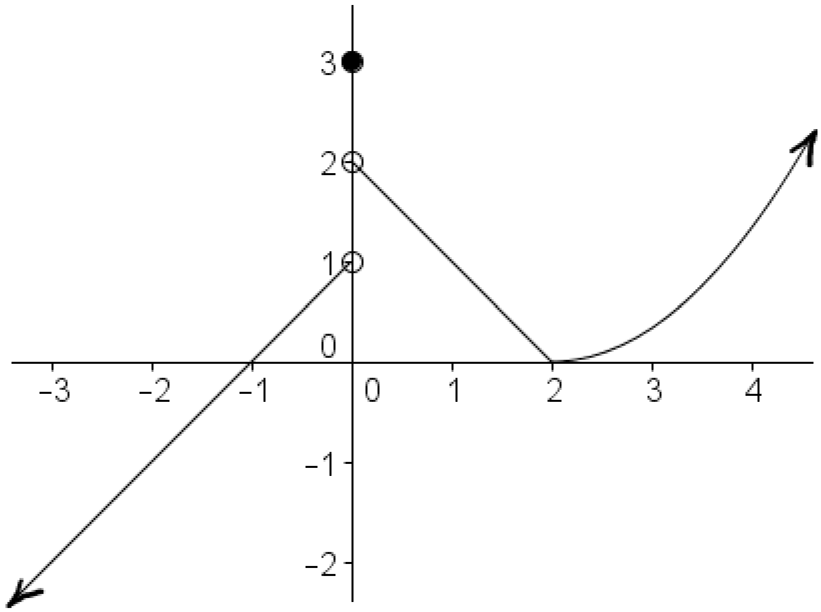
    c. $\lim_{x\to -4}\frac{x+4}{x^2+3x-4} =$

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

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

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

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



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

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

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

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

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

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

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

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

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

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

5. Evaluate

a. $\lim_{x\to\infty} \frac{x-2^x}{2x^3+2^x} =$

b. $\lim_{x\to-\infty} \frac{x-2^x}{2x^3+2^x} =$

c. $\lim_{n\to\infty} \frac{12n^4+3n+1}{n^3+2^n} =$

d. $\lim_{k\to\infty} \frac{\ln(12k^4+3k+1)}{\sqrt{k}} =$

e. $\lim_{k\to\infty} \frac{2k^{10}+3^k}{4k^5-3^k} =$

6. Evaluate

a. $\lim_{x\to0} \frac{\sin(x)}{2x} =$

b. $\lim_{x\to0} \frac{3x}{\tan(2x)} =$

c. $\lim_{t\to0} \frac{1-\cos(t)}{t} =$

d. $\lim_{x\to0} \frac{1-\cos(x)}{2x^2} =$

e. $\lim_{u\to0} \frac{3}{u\csc(2u)} =$

f. $\lim_{x\to0} \frac{1-\cos(x)}{\sin^2(2x)} =$

g. $\lim_{x\to1} \frac{\sin(\pi x)}{x-1} =$

7. Evaluate

a. $\lim_{x\to0} \left(\frac{1}{x} - \frac{2}{x^2}\right) =$

b. $\lim_{x\to0} \frac{\sqrt{3+x}-\sqrt{3}}{x} =$

c. $\lim_{x\to9^-} \frac{x-9}{\sqrt{x}-3} =$

d. $\lim_{x\to9^+} \frac{x-9}{\sqrt{x}-3} =$

e. $\lim_{x\to9} \frac{x-9}{\sqrt{x}-3} =$

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.