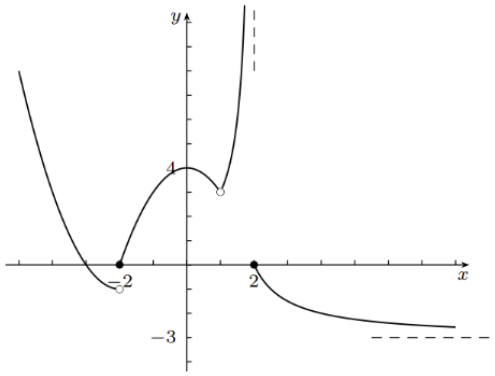
201-SH2-AB - Exercises #1 - Limits from Graphs

1. Given the following graph of $f(x)$, find:



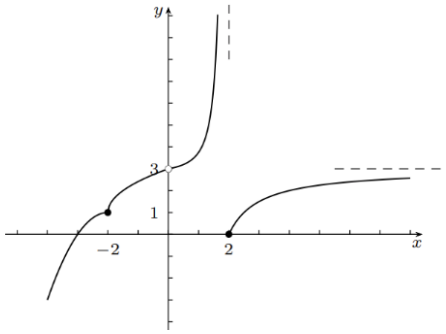
(a) $\lim_{x\to-\infty} f(x)$ (b) $\lim_{x\to-2^-} f(x)$

(c) $\lim_{x\to1} f(x)$ (d) $\lim_{x\to2^+} f(x)$

(e) $\lim_{x\to2^-} f(x)$ (f) $\lim_{x\to2} f(x)$

(g) $\lim_{x\to+\infty} f(x)$

2. Given the following graph of $f(x)$, find:



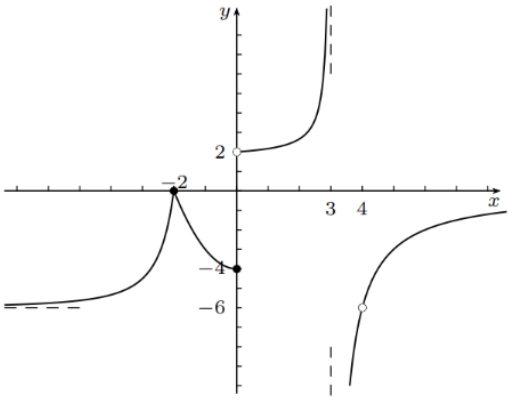
(a) $\lim_{x\to-\infty} f(x)$ (b) $\lim_{x\to-2} f(x)$

(c) $\lim_{x\to0} f(x)$ (d) $\lim_{x\to2^-} f(x)$

(e) $\lim_{x\to2^+} f(x)$ (f) $\lim_{x\to2} f(x)$

(g) $\lim_{x\to+\infty} f(x)$ (h) $f(0)$

3. Given the following graph of $f(x)$, find:



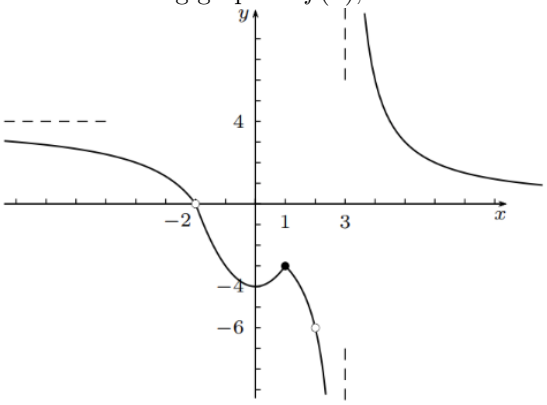
(a) $\lim_{x\to-\infty} f(x)$ (b) $\lim_{x\to-2} f(x)$

(c) $\lim_{x\to0^-} f(x)$ (d) $\lim_{x\to0^+} f(x)$

(e) $f(-2)$ (f) $\lim_{x\to3^+} f(x)$

(g) $\lim_{x\to3^-} f(x)$ (h) $\lim_{x\to+\infty} f(x)$

4. Given the following graph of $f(x)$, find:



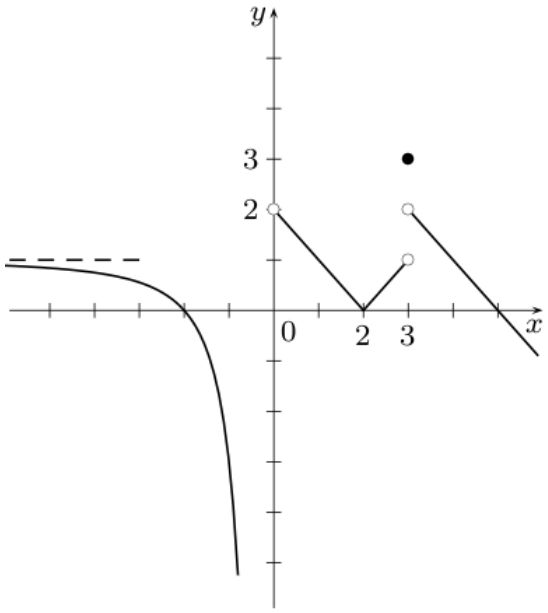
(a) $\lim_{x\to-\infty} f(x)$ (b) $\lim_{x\to0} f(x)$

(c) $\lim_{x\to1} f(x)$ (d) $\lim_{x\to3^-} f(x)$

(e) $\lim_{x\to3^+} f(x)$ (f) $\lim_{x\to2} f(x)$

(g) $\lim_{x\to+\infty} f(x)$ (h) $f(2)$

5. Use the graph of the function $f(x)$ to answer each question.
Use ∞, $-\infty$ or DNE where appropriate.



(a) $f(0) =$

(b) $f(2) =$

(c) $f(3) =$

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

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

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

(g) $\lim_{x \to 3^+} f(x) =$

(h) $\lim_{x \to 3} f(x) =$

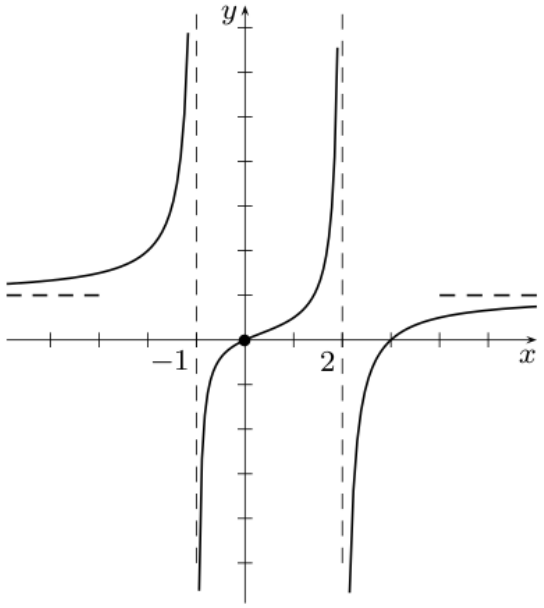
(i) $\lim_{x \to -\infty} f(x) =$

(j) $\lim_{x \to \infty} f(x) =$

(k) $\lim_{x \to 2} \dfrac{1-x}{f(x)} =$

(l) List the value(s) where $f(x)$ is discontinuous and *state the type of discontinuity.

6. Use the graph of the function $f(x)$ to answer each question.
Use ∞, $-\infty$ or DNE where appropriate.



(a) $f(0) =$

(b) $f(2) =$

(c) $f(3) =$

(d) $\lim_{x \to -1} f(x) =$

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

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

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

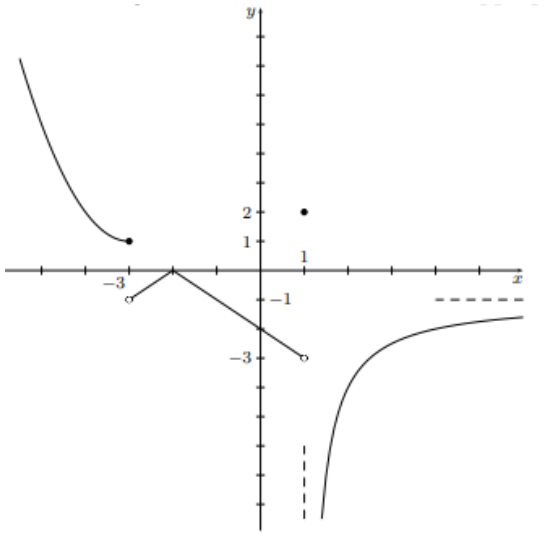
(h) $\lim_{x \to \infty} f(x) =$

(i) $\lim_{x \to -\infty} f(x) =$

(j) $\lim_{x \to 0^+} \dfrac{3}{f(x)} =$

(k) List the value(s) where $f(x)$ is discontinuous and *state the type of discontinuity.

7. Use the graph of the function $g(x)$ to answer each question.
Use ∞, $-\infty$ or DNE where appropriate.



(a) $g(-3) =$

(b) $g(-2) =$

(c) $g(0) =$

(d) $\lim_{x \to -3^-} g(x) =$

(e) $\lim_{x \to -3^+} g(x) =$

(f) $\lim_{x \to -3} g(x) =$

(g) $\lim_{x \to 1^-} g(x) =$

(h) $\lim_{x \to 1^+} g(x) =$

(i) $\lim_{x \to 1} g(x) =$

(j) $\lim_{x \to -\infty} g(x) =$

(k) $\lim_{x \to \infty} g(x) =$

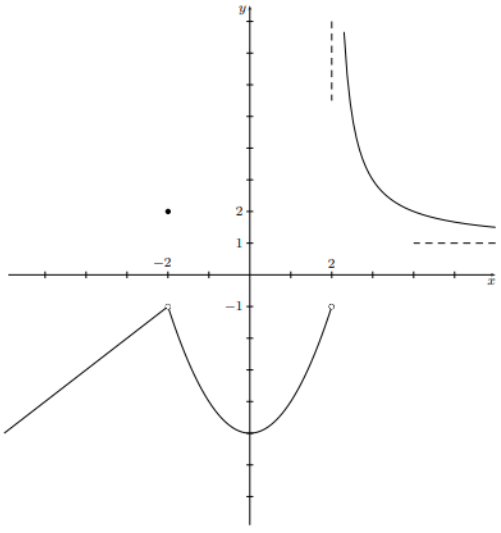
(l) $\lim_{x \to 0} g(x) =$

(m) $\lim_{x \to 0^+} g(x) =$

(n) $\lim_{x \to -2^-} \dfrac{3}{g(x)} =$

(0) List the value(s) where $g(x)$ is discontinuous and *state the type of discontinuity.

8. Use the graph of the function $h(x)$ to answer each question.
Use ∞, $-\infty$ or DNE where appropriate.



(a) $h(-2) =$

(b) $h(0) =$

(c) $\lim_{x \to -2^-} h(x) =$

(d) $\lim_{x \to -2^+} h(x) =$

(e) $\lim_{x \to -2} h(x) =$

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

(g) $\lim_{x \to 0} h(x) =$

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

(i) $\lim_{x \to 2^+} h(x) =$

(j) $\lim_{x \to 2} h(x) =$

(k) $\lim_{x \to -\infty} h(x) =$

(l) $\lim_{x \to \infty} h(x) =$

(m) $\lim_{x \to -2^+} \dfrac{x}{h(x)+1} =$

(n) List the value(s) where $h(x)$ is discontinuous and *state the type of discontinuity.

9. Given the following graph of $f(x)$, find:

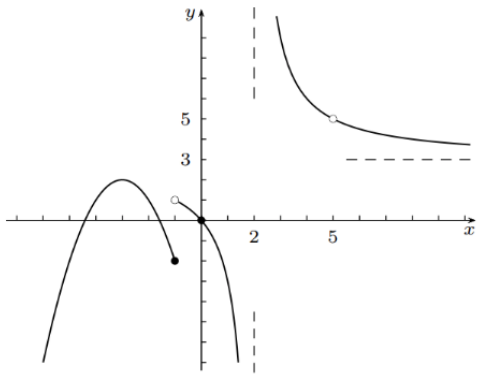
(a) $\lim_{x\to-\infty} f(x)$ (b) $\lim_{x\to-1^+} f(x)$

(c) $\lim_{x\to5} f(x)$ (d) $\lim_{x\to2^-} f(x)$

(e) $\lim_{x\to2^+} f(x)$ (f) $\lim_{x\to-3} f(x)$

(g) $\lim_{x\to+\infty} f(x)$ (h) $\lim_{x\to0^-} \frac{2x+3}{f(x)}$

(i) List the value(s) where $f(x)$ is discontinuous and *state the type of discontinuity.



10. Given the following graph of $f(x)$, find:

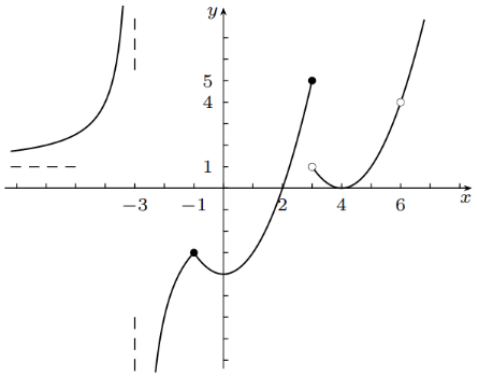
(a) $\lim_{x\to-\infty} f(x)$ (b) $\lim_{x\to-1} f(x)$

(c) $\lim_{x\to3} f(x)$ (d) $\lim_{x\to3^-} f(x)$

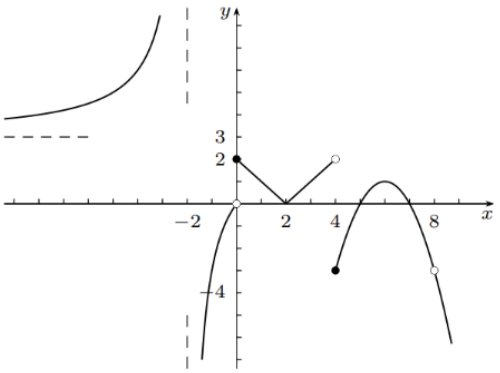
(e) $\lim_{x\to3^+} f(x)$ (f) $\lim_{x\to6} f(x)$

(g) $\lim_{x\to+\infty} f(x)$ (h)$f(3)$

(i) List the value(s) where $hfx)$ is discontinuous and *state the type of discontinuity.



11. Given the following graph of $f(x)$, find:



(a) $\lim_{x\to-\infty} f(x)$ (b) $\lim_{x\to-2^-} f(x)$

(c) $\lim_{x\to0} f(x)$ (d) $\lim_{x\to2} f(x)$

(e) $\lim_{x\to4^+} f(x)$ (f) $f(2)$

(g) $\lim_{x\to8} f(x)$ (h) $f(8)$

(i) List the value(s) where $f(x)$ is discontinuous and *state the type of discontinuity.

12. Given the following graph of $f(x)$, find:

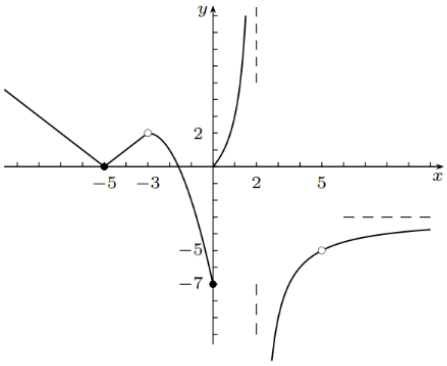
(a) $\lim_{x\to-\infty} f(x)$ (b) $\lim_{x\to-3} f(x)$

(c) $\lim_{x\to0} f(x)$ (d) $\lim_{x\to2^-} f(x)$

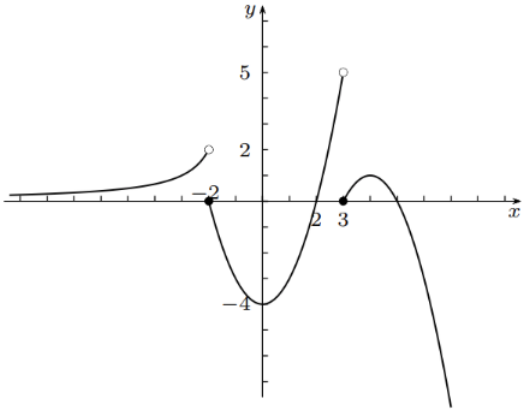
(e) $\lim_{x\to2^+} f(x)$ (f) $\lim_{x\to2} f(x)$

(g) $\lim_{x\to+\infty} f(x)$ (h) $f(-3)$

(i) List the value(s) where $f(x)$ is discontinuous and *state the type of discontinuity.



13. Given the following graph of $f(x)$, find:



(a) $\lim_{x\to-\infty} f(x)$ (b) $\lim_{x\to-2^-} f(x)$

(c) $\lim_{x\to-2^+} f(x)$ (d) $\lim_{x\to3^-} f(x)$

(e) $\lim_{x\to2} f(x)$ (f) $\lim_{x\to0} f(x)$

(g) $\lim_{x\to+\infty} f(x)$ (h) $\lim_{x\to2}(7f(x)-3x+5)$

(i) List the value(s) where $f(x)$ is discontinuous and *state the type of discontinuity.

14. Given the following graph of $f(x)$, find:

(a) $\lim_{x\to-\infty} f(x)$ (b) $\lim_{x\to-2} f(x)$

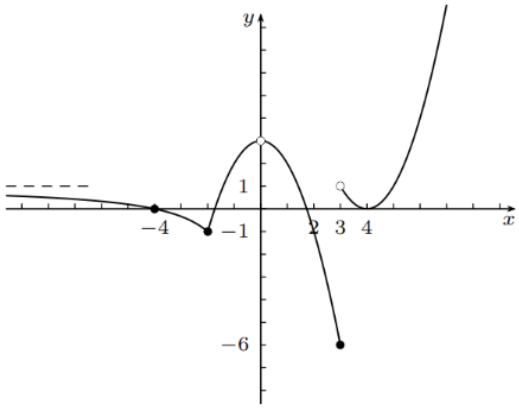
(c) $\lim_{x\to0} f(x)$ (d) $\lim_{x\to3^-} f(x)$

(e) $\lim_{x\to3^+} f(x)$ (f) $\lim_{x\to3} f(x)$

(g) $\lim_{x\to+\infty} f(x)$ (h) $f(3)$

(i) $\lim_{x\to-2} \frac{2x+1}{f(x)+1}$ (j) $\lim_{x\to3^-} \frac{2f(x)+9}{f(x)}$

(k) List the value(s) where $f(x)$ is discontinuous and *state the type of discontinuity.



15. *Sketch ONE graph of a function that satisfies ALL of the following conditions (one graph for all the things)

a) $\lim_{x\to4^-} f(x) = 2$

b) $\lim_{x\to4^+} f(x) = 4$

c) $f(4) = 3$

d) $\lim_{x\to-2} f(x) = 3$

e) $f(-2) = 1$

f) there is an infinite discontinuity for some x value

16. *Sketch ONE graph of a function that satisfies ALL of the following conditions (one graph for all the things)

a) There is a removable discontinuity at $x = 3$, and $f(3)$ is defined.

b) There is a removable discontinuity at $x = 5$, but $f(5)$ is not defined

c) There is an infinite discontinuity at $x = -1$, $\lim_{x\to-1^+} = 5$, and $f(-1) = 2$.

17. (a) *Sketch ONE graph of a function that satisfies ALL of the following conditions (one graph for all the things)

(i) $\lim_{x\to3} f(x) = 8$
(ii) $f(3) = 2$
(iii) $\lim_{x\to\infty} f(x) = 8$
(iv) There is only one horizontal asymptote.
(v) $\lim_{x\to4^-} f(x) = 5$
(vi) $\lim_{x\to4^+} f(x) = -3$
(vii) $\lim_{x\to-1^-} f(x) = \infty$
(viii) $\lim_{x\to-1^+} f(x) = 7$
(ix) $f(-1) = 0$

(b) List all of the discontinuities of the graph you have sketched and state the type.

Answers

1. (a) ∞
   (b) -1
   (c) 3
   (d) 0
   (e) ∞
   (f) dne
   (g) -3

2. (a) $-\infty$
   (b) 1
   (c) 3
   (d) ∞
   (e) 0
   (f) dne
   (g) 3
   (h) dne

3. (a) -6
   (b) 0
   (c) -4
   (d) 2
   (e) 0
   (f) $-\infty$
   (g) ∞
   (h) 0

4. (a) 4
   (b) -4
   (c) -3
   (d) $-\infty$
   (e) ∞
   (f) -6
   (g) 0
   (h) dne

5. (a) dne
   (b) 0
   (c) 3
   (d) $-\infty$
   (e) dne
   (f) 2
   (g) 2
   (h) dne
   (i) 1
   (j) $-\infty$
   (k) $-\infty$
   (l) infinite discontinuity: $x = 0$
   jump discontinuity: $x = 3$

6. (a) 0
   (b) dne
   (c) 0
   (d) dne
   (e) 0
   (f) $-\infty$
   (g) ∞
   (h) 1
   (i) 1
   (j) ∞
   (k) infinite discontinuity: $x = -1, 2$

7. (a) 1
   (b) 0
   (c) -2
   (d) 1
   (e) -1
   (f) dne
   (g) -3
   (h) $-\infty$
   (i) dne
   (j) ∞
   (k) -1
   (l) -2
   (m) -2
   (n) $-\infty$
   (o) infinite discontinuity: $x = 1$
   jump discontinuity: $x = -3$

8. (a) 2
   (b) -5
   (c) -1
   (d) -1
   (e) -1
   (f) -5
   (g) -5
   (h) -1
   (i) ∞
   (j) dne
   (k) $-\infty$
   (l) 1
   (m) ∞
   (n) infinite discontinuity: $x = 2$
   removable discontinuity: $x = -2$

9. (a) $-\infty$
   (b) 1
   (c) 5
   (d) $-\infty$
   (e) ∞
   (f) 2
   (g) 3
   (h) ∞
   (i) jump discontinuity: $x = -1$
   infinite discontinuity: $x = 2$
   removable discontinuity: $x = 5$

10. (a) 1
    (b) -3
    (c) dne
    (d) 5
    (e) 1
    (f) 4
    (g) ∞
    (h) 5
    (i) infinite discontinuity: $x = -3$
    jump discontinuity: $x = 3$
    removable discontinuity: $x = 6$

11. (a) 3
    (b) ∞
    (c) dne
    (d) 0
    (e) -3
    (f) 0
    (g) -3
    (h) dne
    (i) infinite discontinuity: $x = -2$
    jump discontinuity: $x = 0, x = 4$
    removable discontinuity: $x = 8$

12. (a) ∞
    (b) 2
    (c) dne
    (d) ∞
    (e) $-\infty$
    (f) dne
    (g) -3
    (h) dne
    (i) removable discontinuity: $x = -3, x = 5$
    jump discontinuity: $x = 0$
    infinite discontinuity: $x = 2$

13. (a) 0
    (b) 2
    (c) 0
    (d) 5
    (e) 0
    (f) -4
    (g) $-\infty$
    (h) $7(0) - (3)(2) + 5 = -1$
    (i) jump discontinuity: $x = -2, 3$

14. (a) 1
    (b) -1
    (c) 3
    (d) -6
    (e) 1
    (f) dne
    (g) ∞
    (h) -6
    (i) $-\infty$
    (j) $\frac{2(-6)+9}{-6} = \frac{1}{2}$
    (k) removable discontinuity: $x = 0$
    jump discontinuity: $x = 3$

15. Many possible options. Check with your teacher.
16. Many possible options. Check with your teacher.
17. (a) Many possible options. Check with your teacher.
    (b) removable discontinuity: $x = 3$
    jump discontinuity: $x = 4$
    infinite discontinuity: $x = -1$
    Plus any other discontinuities that you may have chosen to draw in.