Last updated on 2016/10/17 at 10:45:57. Please inform me of mistakes.
Do not do the exercises in order. I suggest that you first complete a couple exercises from each topic. If you have more time, do more exercises from each topic.

0.1 Topic: Evaluating limits

1. Let $F(t)$ be a function defined by

$$F(t) = \frac{t^2 + 3t - 1}{5}.$$

   (a) Evaluate $\lim_{t\to 0} F(t)$

   (b) Evaluate $\lim_{t\to 1} F(t)$

   (c) Identify any points at which F is discontinuous.

2. Evaluate $\lim_{t\to 0} 7 + x - \sqrt{7} + \frac{x+2}{x+1}$.

3. Evaluate $\lim_{t\to 0^+} \frac{\sqrt{7+x} - \sqrt{7-x}}{2x}$.

4. Evaluate $\lim_{t\to 1^-} \frac{\sqrt{2x+1} - \sqrt{3}}{x-1}$.

0.2 Topic: Identifying Vertical asymptotes analytically

Identify the vertical asymptotes (if any) of following functions. If the function has no vertical asymptotes, say so.

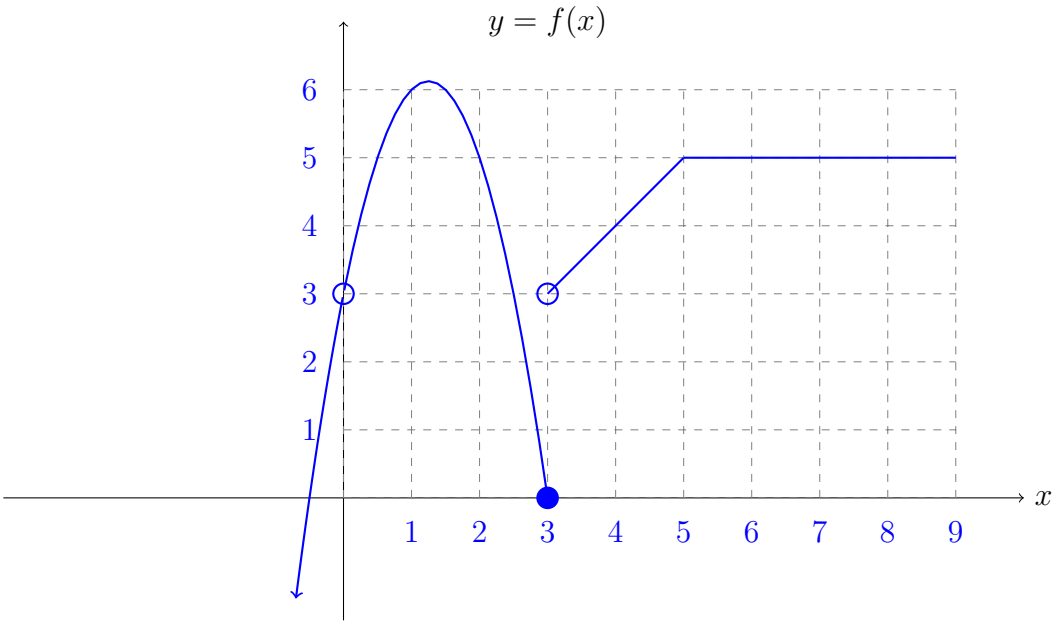
1.
$$f(t) = \frac{5}{t^{10} - 2t^9}.$$

2.
$$g(x) = \frac{x+1}{(x-5)(x^3+1)}.$$

3. $h(x) = x^2 - 25x^2 + x + 3$.

0.3 Topic: Reading and sketching graphs

The figure shows the graph of a function $f(x)$.



Read the value graph; if it does not exist or is not defined, just say so.

1. $\lim_{x \to 0^-} f(x)$
2. $\lim_{x \to 0^+} f(x)$
3. $\lim_{x \to 0} f(x)$
4. $\lim_{x \to 3^-} f(x)$
5. $\lim_{x \to 3^+} f(x)$
6. $\lim_{x \to 3} f(x)$
7. $\lim_{x \to 4^-} f(x)$
8. $\lim_{x \to 4^+} f(x)$
9. $\lim_{x \to 4} \dfrac{f(x)}{11}$
10. $\lim_{x \to 5^-} f(x)$
11. $\lim_{x \to 5^+} f(x)$
12. $\lim_{x \to 5} \dfrac{f(x)}{x}$
13. $\lim_{x \to 7^-} f(x)$
14. $\lim_{x \to 7^+} f(x)$
15. $\lim_{x \to 7} \dfrac{x+1}{f(x)}$

16. $f(0)$
17. $f(3)$
18. $f(4)$
19. $f(5)$
20. $f(6)$
21. $f(7)$
22. For each part, answer True / False
    (a) f is continuous on [0,2].
    (b) f is continuous on (0,2).
    (c) f is continuous on [1,3].
    (d) f is continuous on (1,3).
    (e) f is continuous on [3,5].
    (f) f is continuous on (3,5).
    (g) f is continuous on [3,6].
    (h) f is continuous on (3,6).
    (i) f is continuous on [4,6].
    (j) f is continuous on (4,6).
23. For each part, answer True / False
    (a) $\lim_{x\to 0^-} f(x) = f(0)$.
    (b) f is continuous at 0.
    (c) f has a removable discontinuity at 0.
    (d) f has a non-removable discontinuity at 0.
    (e) $\lim_{x\to 2^+} f(x) = f(2)$.
    (f) f is continuous at 2.
    (g) f has a removable discontinuity at 2.
    (h) f has a non-removable discontinuity at 2.
    (i) $\lim_{x\to 3^-} f(x) = f(3)$.
    (j) f is continuous at 3.
    (k) f has a removable discontinuity at 3.
    (l) f has a non-removable discontinuity at 3.
    (m) $\lim_{x\to 5} f(x) = f(5)$.
    (n) f is continuous at 5.
    (o) f has a removable discontinuity at 5.
    (p) f has a non-removable discontinuity at 5.

(q) f is continuous on (1,3).

(r) f is continuous on [3,5].

(s) f is continuous on (3,5).

(t) f is continuous on [3,6].

(u) f is continuous on (3,6).

(v) f is continuous on [4,6].

(w) f is continuous on (4,6).

24. For each part, set up suitable axes and sketch the graph of a function satisfying all the given conditions. Make your drawing as clear as possible. If I cannot tell whether it's correct, I'll assume it's not.

(a) f(1)=2; f has a removable discontinuity at 1, but f is continuous everywhere else.

(b) f(1) is not defined; f has a removable discontinuity at 1, but f is continuous everywhere else.

(c) f(1)=2; f has a non-removable discontinuity at 1, but f is continuous everywhere else.

(d) f(1) is not defined; f has a non-removable discontinuity at 1, but f is continuous everywhere else.

(e) f is continuous everywhere except at $x = 2$ and $x = 5$, and $\lim_{x\to 2} f(x) = +\infty$ and $\lim_{x\to 5} f(x) = -\infty$.

(f) f is continuous on $(2, 5)$, and $\lim_{x\to 2^+} f(x) = +\infty$ and $\lim_{x\to 5^-} f(x) = +\infty$.

(g) f is continuous on $(2, 5)$, and $\lim_{x\to 2^+} f(x) = +\infty$ and $\lim_{x\to 5^-} f(x) = -\infty$.

(h) f is continuous on $(2, 5)$, and $\lim_{x\to 2^+} f(x) = -\infty$ and $\lim_{x\to 5^-} f(x) = -\infty$

0.4 Topic: Intermediate Value Theorem

1. Fill each blank with either an English word or a mathematical symbol so that the following is a complete and accurate statement of the Intermediate Value Theorem.

   If a _____ $f(x)$ is _____ on the _____ interval $[a, b]$, and a number M is between ____ and ____, then there is at least one point c in _____ where _____ = ____.

2. For each part, answer either True or False. For all parts, assume that f is continuous on $[0, 2]$, that $f(0) = -10$ and $f(2) = 10$.

(a) There must be at least one value c in $(0, 2)$ where $f(c) = 10$.

(b) There must be at least one value c in $[0, 2]$ where $f(c) = 10$.

(c) There must be at least one value c in $[0, 2]$ where $f(c) = -1$.

(d) There must be at least one value c in $[0, 2]$ where $f(c) = -20$.

(e) $f(1)$ must be between -10 and 10.

0.5 Topic: Evaluating limits (part 2)

Evaluate the following limits. Whenever appropriate, answer with $+\infty$ or $-\infty$.

1. $\lim_{x\to 2^+} \dfrac{x}{x-2}$.
2. $\lim_{x\to 2} \dfrac{1-x}{(x-2)^2}$.
3. $\lim_{x\to 5^-} \dfrac{5-x}{(x-2)^2}$.
4. $\lim_{x\to 5^+} \dfrac{5+x}{(x-2)^2}$.
5. $\lim_{x\to -1^+} \dfrac{x^3+1}{x+1}$.