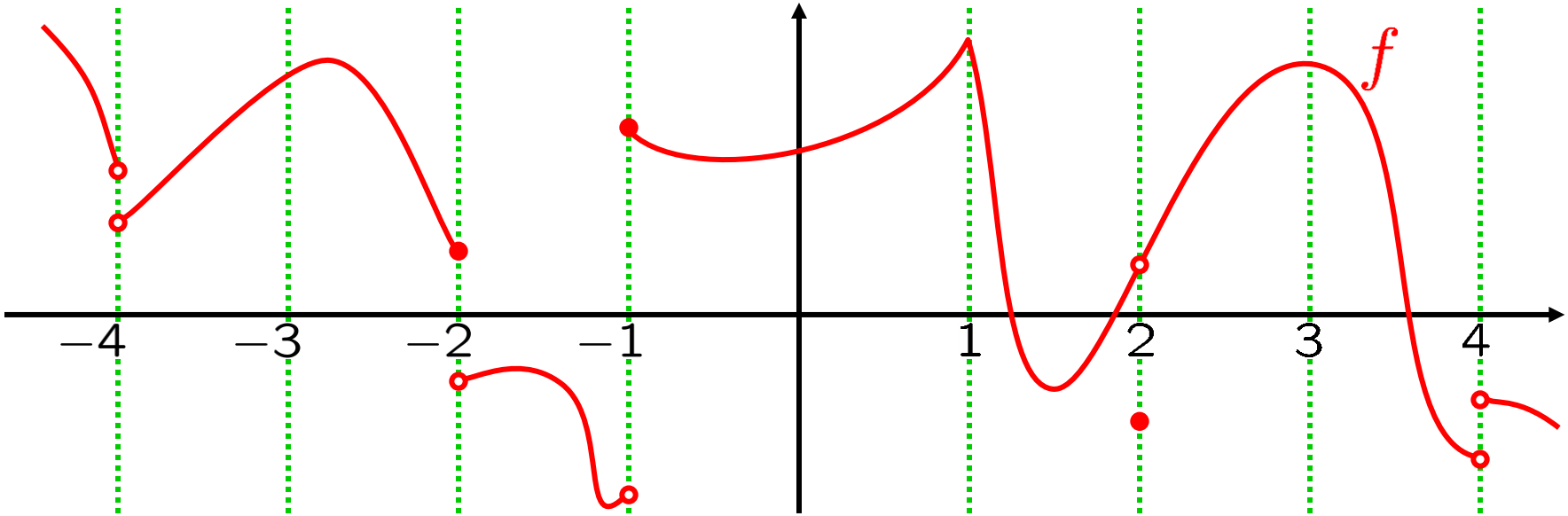
CALCULUS
Continuity
OLD



0210-1. a. At which numbers is the function f, shown above, discontinuous?

OLD

b. For each of the numbers, given in Part a, where f is discontinuous, state whether or not f is continuous from the LEFT at that number.

c. For each of the numbers, given in Part a, where f is discontinuous, state whether or not f is continuous from the RIGHT at that number.

0210-2. Display the graph of a function f

OLD

s.t. $\lim_{x\to -1^-} f(x) = -3, \quad \lim_{x\to -1^+} f(x) = 1,$

and s.t. $f(-1) = -2,$

and s.t. $\lim_{x\to 1^-} f(x) = \infty, \quad \lim_{x\to 1^+} f(x) = -\infty,$

and s.t. $\lim_{x\to 2} f(x) = -\infty$

and s.t. $\lim_{x\to -\infty} f(x) = 1, \quad \lim_{x\to \infty} f(x) = -4.$

OLD 0210-3. Let $f(x) = (2\sqrt{x} + 3)^{100}$.

Using the properties of limits, show that f is continuous at 7.

OLD 0210-4.

Let $f(x) = \begin{cases} 2x + 5, & \text{if } x < -1 \\ 4, & \text{if } x = -1 \\ x^2 + 2, & \text{if } x > -1. \end{cases}$

a. Does $\lim_{x \to -1} f(x)$ exist? If so, compute it.

b. Is f continuous at -1?

0210-5.
OLD

Let $g(x) = \begin{cases} \sin x, & \text{if } x < 0 \\ 4, & \text{if } x = 0 \\ x^2 + 2, & \text{if } x > 0. \end{cases}$

a. Does $\lim_{x \to 0} g(x)$ exist? If so, compute it.

b. Is g continuous at 0?

0210-6.
OLD

Let $g(x) = \begin{cases} \sin x, & \text{if } x < 0 \\ 4, & \text{if } x = 0 \\ x^2 + 2, & \text{if } x > 0. \end{cases}$

a. Does $\lim_{x \to -1} g(x)$ exist? If so, compute it.

b. Is g continuous at -1?

0210-7. Let $f(x) = \sqrt{x}$.

OLD

a. Is f continuous at 0?

b. Is f continuous on $[0, \infty)$?

c. Is f continuous?

0210-8. Let $g(x) = 1/\sqrt{x}$.

OLD

a. Is g continuous at 0?

b. Is g continuous on $(0, \infty)$?

c. Is g continuous?

0210-9. Compute $\lim_{x \to 3} \dfrac{x + \sqrt[7]{x}}{2x^3 - 3x - 8}$.

OLD

0210-10. Let $f(x) = \begin{cases} x^2 + 3, & \text{if } x < 2 \\ 2x + 3, & \text{if } 2 \leq x < 3 \\ 5[\cos(x - 3)], & \text{if } 3 \leq x. \end{cases}$

OLD

a. At which numbers is the function f discontinuous?

b. For each of the numbers, given in Part a, where f is discontinuous, state whether or not f is continuous from the LEFT at that number.

c. For each of the numbers, given in Part a, where f is discontinuous, state whether or not f is continuous from the RIGHT at that number.

0210-11. Let $g(x) = \begin{cases} 3e^x, & \text{if } x \leq 0 \\ (x+2)^2, & \text{if } 0 < x < 1 \\ 9x, & \text{if } 1 < x. \end{cases}$

OLD

a. At which numbers is the function g discontinuous?

b. For each of the numbers, given in Part a, where g is discontinuous, state whether or not the discontinuity is removable.

0210-12. Find a number a s.t.
OLD

$$f(x) = \begin{cases} ae^x, & \text{if } x \leq 0 \\ 2ax^2 + 4a - 6, & \text{if } 0 < x \end{cases}$$

is continuous at $x = 0$.

0210-13. Let $h(x) = \dfrac{x^2 + 2x - 8}{x - 2}$.
OLD

Find a function $p : \mathbb{R} \to \mathbb{R}$
such that p is continuous at 2
and such that, $\forall x \in \mathbb{R} \backslash \{2\}, \quad p(x) = h(x)$.

0210-14.
OLD

Using the Intermediate Value Theorem,
show that $x^5 + 2x - 8 = 0$ has a solution $x = c$
that satisfies $-2 < c < 2$.

0210-15.
OLD

Using the Intermediate Value Theorem,
show that $e^x = x + 7$ has a solution $x = c$
that satisfies $-1 < c < 5$.