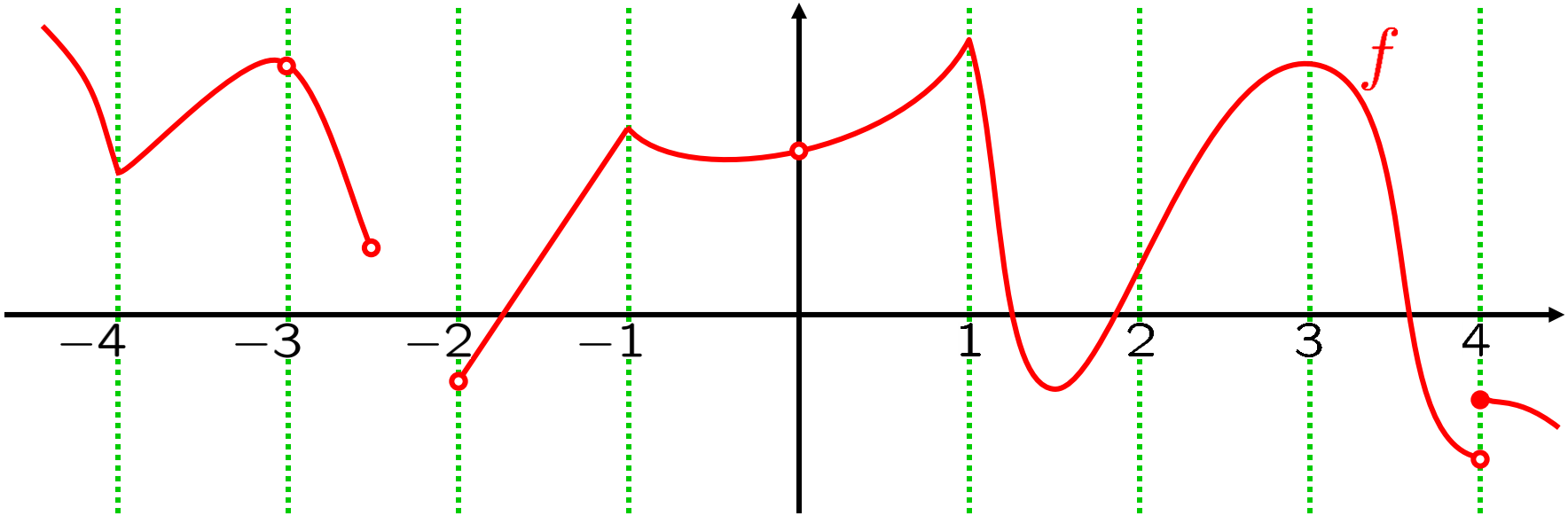
CALCULUS
Continuity
NEW



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

NEW 0210-2. Display the graph of a function f

s.t. $\lim_{x\to -1^-} f(x) = 2$, $\lim_{x\to -1^+} f(x) = 3$,

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

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

and s.t. $\lim_{x\to 2} f(x) = -1$, $f(2) = 0$,

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

0210-3. NEW Let $f(q) = \left[\dfrac{q^2+1}{q-1}\right]^{4/3}$.

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

0210-4. NEW

Let $f(x) = \begin{cases} 2x+5, & \text{if } x < -1 \\ 3, & \text{if } x = -1 \\ x^6+4, & \text{if } x > -1. \end{cases}$

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

b. Is f continuous from the left at -1?

0210-5.
NEW

Let $g(x) = \begin{cases} \cos(2x), & \text{if } x < 0 \\ 2, & \text{if } x = 0 \\ x^2 + 1, & \text{if } x > 0. \end{cases}$

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

b. Is g continuous at 0?

0210-6.
NEW

Let $g(x) = \begin{cases} \cos(2x), & \text{if } x < 0 \\ 2, & \text{if } x = 0 \\ x^2 + 1, & \text{if } x > 0. \end{cases}$

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

b. Is g continuous at 1?

NEW 0210-7. Let $f(x) = x^{3/2}$.

a. Is f continuous at 0?

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

c. Is f continuous?

NEW 0210-8. Let $g(x) = x^{-3/2}$.

a. Is g continuous at 0?

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

c. Is g continuous?

NEW 0210-9. Compute $\lim_{x \to 16} \left[\dfrac{x^{3/4} + x}{4 + \sqrt{x}} \right]$.

0210-10 NEW. Let $f(x) = \begin{cases} 1 - x^2, & \text{if } x \leq 1 \\ 2x - 2, & \text{if } 1 < x \leq 3 \\ e^x, & \text{if } 3 < x. \end{cases}$

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 NEW. Let $g(x) = \begin{cases} 4e^x, & \text{if } x < 0 \\ 8, & \text{if } x = 0 \\ 7x + 5, & \text{if } 0 < x. \end{cases}$

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. NEW Find a number a s.t.

$$f(x) = \begin{cases} a\cos x, & \text{if } x < 0 \\ ax^3 - 3a + 8, & \text{if } 0 \le x \end{cases}$$

is continuous at $x = 0$.

0210-13. NEW Let $h(u) = \dfrac{u^3 - 1}{u - 1}$.

Find a function $q : \mathbb{R} \to \mathbb{R}$

such that q is continuous at 1

and such that, $\forall u \in \mathbb{R}\backslash\{1\}, \quad q(u) = h(u)$.

0210-14.
NEW

Using the Intermediate Value Theorem,
show that $x^5 + 2x + 100 = 0$ has a sol'n $x = c$
that satisfies $-3 < c < 3$.

0210-15.
NEW

Using the Intermediate Value Theorem,
show that $4e^x - \sin x = x + 6$ has a sol'n $x = c$
that satisfies $-2 < c < 9$.