CALCULUS
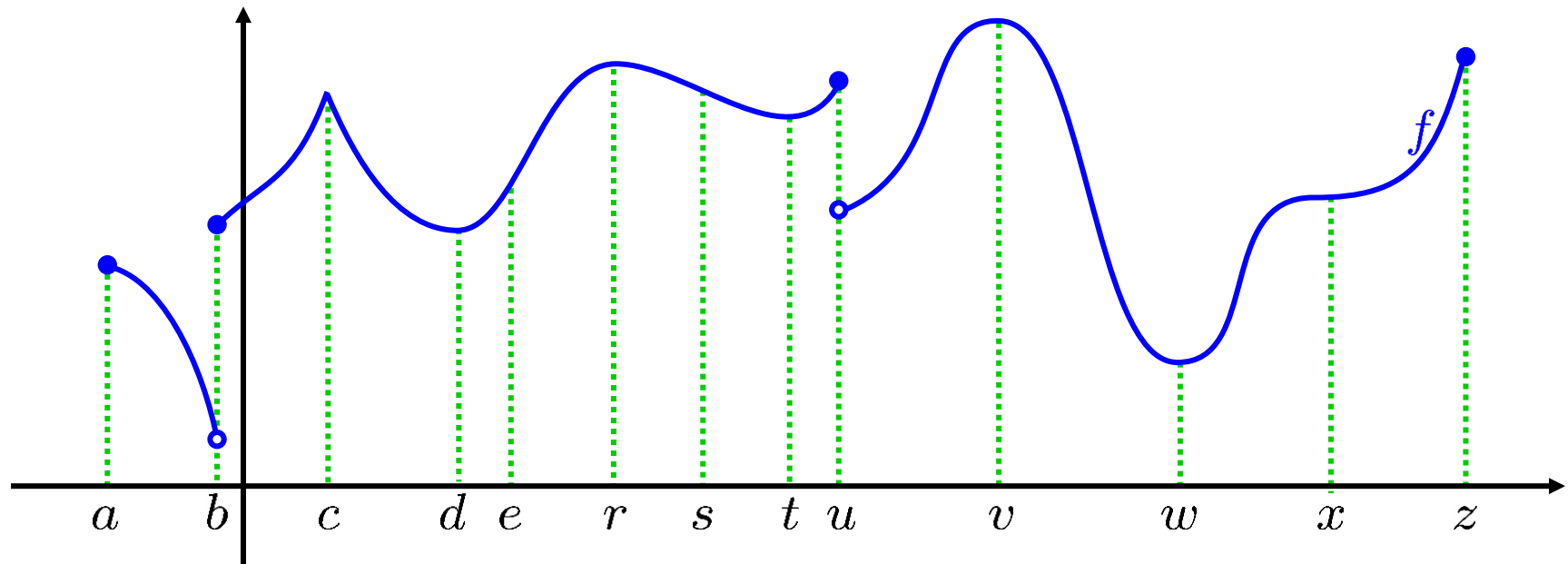# Maxima and minima
OLD2

0450-1.a. Sketch the graph of a continuous function whose domain is $[2, \infty)$, and which has exactly two global minima, and exactly one local minimum.

OLD2

b. Sketch the graph of a continuous function whose domain is $(2, 4]$, and which has exactly two local minima, and no global minima.

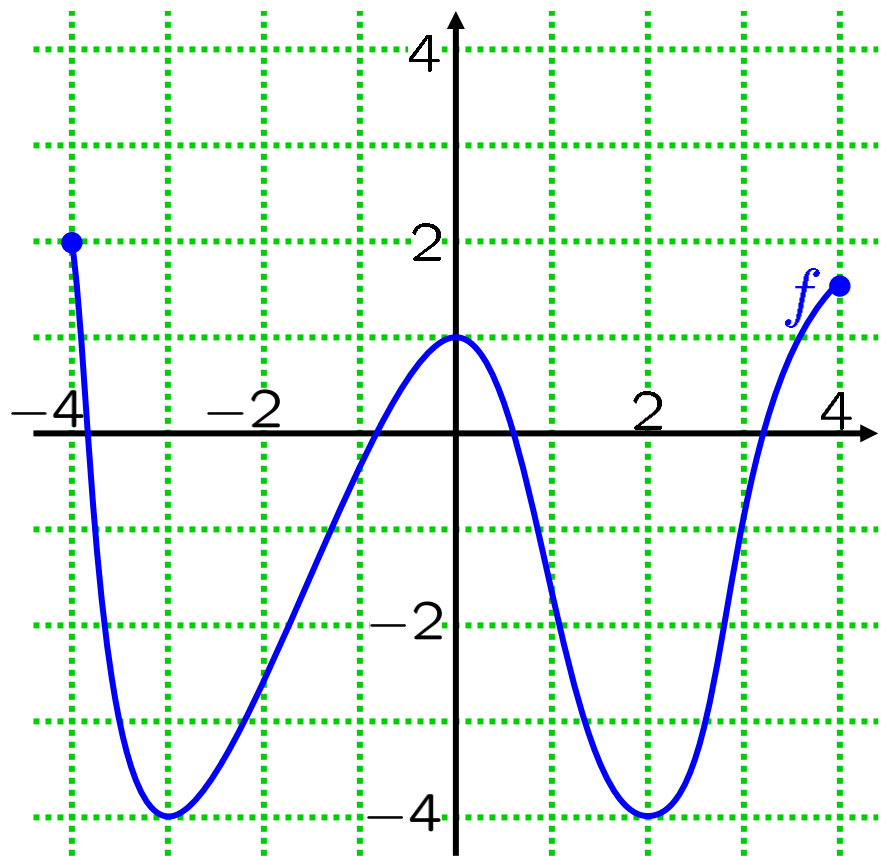Let $f : [a, z] \to \mathbb{R}$ be the function whose graph is shown below.

i. For each number $a, b, c, d, e, r, s, t, u, v, w, x, z$, state whether or not f has, at that number,

- a global maximum
- a global minimum
- a local maximum
- a local minimum.

ii. Which of $a, b, c, d, e, r, s, t, u, v, w, x, z$, is a critical number for f?

3

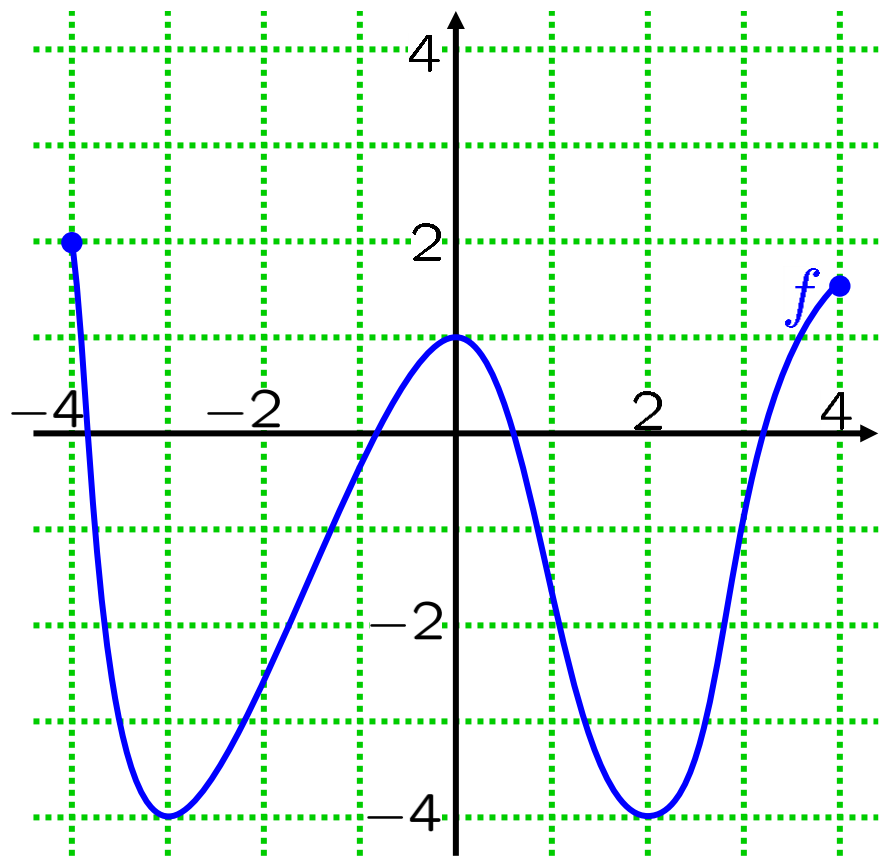Let $f : [-4, 4] \to \mathbb{R}$ be the function whose graph is displayed below.

OLD2

a. At what numbers x does $f(x)$ have a local minimum?

b. What are the corresponding local minimum values?

c. At what numbers x does $f(x)$ have a local maximum?

d. What are the corresponding local maximum values?

4

OLD2 **Let** $f : [-4, 4] \to \mathbb{R}$ be the function whose graph is displayed below.

a. At **what** numbers x does $f(x)$ have a global minimum?

b. **What** is the corresponding global minimum value?

c. At **what** numbers x does $f(x)$ have a global maximum?

d. **What** is the corresponding global maximum value?

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0450-5.
Sketch a graph of a continuous function
whose domain is $(-3, 2)$ and which has
no global maxima,
two local maxima,
and two global minima.

0450-6.
Sketch a graph of a function whose domain
is $[1, 4]$, which is continuous on $[1, 4]$
and which has
two global maxima,
one local maximum
and two local minima.

6

0450-7. Define $f : [-2, 2] \to \mathbb{R}$ by $f(x) = x^4$.

a. Sketch the graph of f.

b. Does f have a global maximum? If so, at what number(s)?

c. Does f have a global minimum? If so, at what number(s)?

d. Does f have a local maximum? If so, at what number(s)?

e. Does f have a local minimum? If so, at what number(s)?

f. What are the critical numbers of f?

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Define $f : (-2, 2) \to \mathbb{R}$ by $f(x) = x^4$.

OLD2

a. Sketch the graph of f.

b. Does f have a global maximum?
   If so, at what number(s)?

c. Does f have a global minimum?
   If so, at what number(s)?

d. Does f have a local maximum?
   If so, at what number(s)?

e. Does f have a local minimum?
   If so, at what number(s)?

f. What are the critical numbers of f?

0450-9. Define $f : [-2, 2] \to \mathbb{R}$ by $f(x) = x$.

a. Sketch the graph of f.

b. Does f have a global maximum? If so, at what number(s)?

c. Does f have a global minimum? If so, at what number(s)?

d. Does f have a local maximum? If so, at what number(s)?

e. Does f have a local minimum? If so, at what number(s)?

f. What are the critical numbers of f?

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Define $f : (-2, 2) \to \mathbb{R}$ by $f(x) = x$.

a. Sketch the graph of f.

b. Does f have a global maximum?
If so, at what number(s)?

c. Does f have a global minimum?
If so, at what number(s)?

d. Does f have a local maximum?
If so, at what number(s)?

e. Does f have a local minimum?
If so, at what number(s)?

f. What are the critical numbers of f?

10

Define $f : (-2, 2) \to \mathbb{R}$ by
$$f(x) = 3 - 2x^2.$$

a. Sketch the graph of f.

b. Does f have a global maximum? If so, at what number(s)?

c. Does f have a global minimum? If so, at what number(s)?

d. Does f have a local maximum? If so, at what number(s)?

e. Does f have a local minimum? If so, at what number(s)?

f. What are the critical numbers of f?

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0450-12. Define $f : [-2, 2] \to \mathbb{R}$ by
$$f(x) = 3 - 2x^2.$$

  a. Sketch the graph of f.

  b. Does f have a global maximum? If so, at what number(s)?

  c. Does f have a global minimum? If so, at what number(s)?

  d. Does f have a local maximum? If so, at what number(s)?

  e. Does f have a local minimum? If so, at what number(s)?

  f. What are the critical numbers of f?

0450-13. Find the critical numbers of
$$f(x) = 2x^3 + 3x^2 - 72x + 12.$$

0450-14. Find the critical numbers of
$$f(x) = |x^2 - 10x + 21|.$$

0450-15. Find the critical numbers of
$$f(x) = |x^2 - 2x + 1|.$$

0450-16. Find the critical numbers of
$$f(x) = \cos x.$$

0450-17. Find the critical numbers of
$$f(x) = |\cos x|.$$

0450-18. Find the global maximum and minimum values of
$$f(x) = x^3 - 15x^2 + 48x - 6$$
on $0 \le x \le 10$.

0450-19. Find the global maximum and minimum values of
$$g(t) = \frac{3t}{t^2 + 9}$$
on $-5 \le t \le 5$.

0450-20. Find the global maximum and minimum values of
$$H(s) = se^{-s^2/8}$$
on $-4 \le s \le 8$.