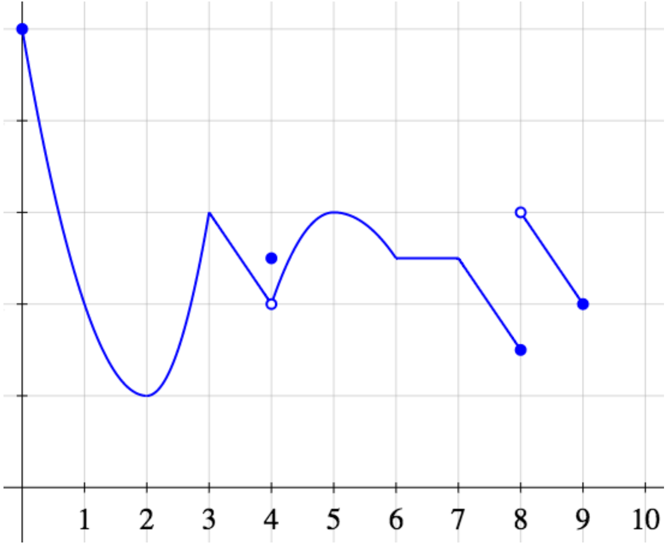
- Today: Local extrema.

- Homework before Wednesday's class:
  watch videos 5.5, 5.6
  (also you may want to watch 5.7, 5.8, 5.9 in advance).

Definition of local extremum

Find local and global extrema of the function with this graph:



Where is the maximum?

We know the following about the function h:

- The domain of h is $(-4, 4)$.
- h is continuous on its domain.
- h is differentiable on its domain, except at 0.
- $h'(x) = 0 \quad \iff \quad x = -1$ or 1.

What can you conclude about the maximum of h?

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What can you conclude about the maximum of h?

1. h has a maximum at $x = -1$, or 1.
2. h has a maximum at $x = -1, 0$, or 1.
3. h has a maximum at $x = -4, 1, 0, 1$, or 4.
4. None of the above.

Fractional exponents

Let $g(x) = x^{2/3}(x-1)^3$.

Find local and global extrema of g on $[-1, 2]$.

What can you conclude?

We know the following about the function f.

- f has domain $\mathbb{R}$.
- f is continuous
- $f(0) = 0$
- For every $x \in \mathbb{R}$, $f(x) \geq x$.

What can you conclude about $f'(0)$? Prove it.

Hint: Sketch the graph of f. Looking at the graph, make a conjecture.
To prove it, imitate the proof of the Local EVT from Video 5.3.

Trig extrema

Let $f(x) = \dfrac{\sin x}{3 + \cos x}$.

Find the maximum and minimum of f.

Practice: topics from before

1) Find $\tan(\operatorname{arcsec} x)$ for $0 < x < \pi/2$.

2) Find $(\operatorname{arccot} x)'$.

3) Find y' if $x^y = y^x$.

4) Find the equation of the tangent line to the curve $x^y = y^x$ in the (x, y)-plane at the point $(x_0, y_0) = (2, 4)$.