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.
- $h'(x) = 0 \iff x = -1$ or 1.

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.
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.
- $h'(x) = 0 \iff x = -1$ or 1.

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

Find the maximum and minimum of $f$. 
1) Find $\tan(\text{arcsec } x)$ for $0 < x < \pi/2$.

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

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 $(x_0, y_0) = (2, 4)$. 