

Swift 262: 2015-01-14 correction.

Example: Help with problem 4 - correction  
from class.

$$\text{Let } f(x) = x^3 - x^2 - x.$$

$$\text{Find } \max_{-1 \leq x \leq 1} |f(x)| = \max_{x \in [-1, 1]} |f(x)|$$

↑  
note 2 notations for the same thing.

To do this, find  $\max_{x \in [-1, 1]} f(x)$  and  $\min_{x \in [-1, 1]} f(x)$ .

Evaluate  $f(x)$  at the end points and critical pts.

$$f'(x) = 3x^2 - 2x - 1 = (3x + 1)(x - 1)$$

The critical points are  $-\frac{1}{3}$  and  $1$ .

Evaluate  $f(x)$  at  $-1$ ,  $-\frac{1}{3}$ , and  $1$

$$f(-1) = (-1)^3 - (-1)^2 - (-1) = -1 - 1 + 1 = -1, \quad f(1) = 1^3 - 1^2 - 1 = -1$$

$$f\left(-\frac{1}{3}\right) = \left(-\frac{1}{3}\right)^3 - \left(-\frac{1}{3}\right)^2 - \left(-\frac{1}{3}\right) = -\frac{1}{27} - \frac{1}{9} + \frac{1}{3} = \frac{-1 - 3 + 9}{27} = \frac{5}{27}$$

So  $\min_{x \in [-1, 1]} f(x) = -1$ ,  $\max_{x \in [-1, 1]} f(x) = \frac{5}{27}$

$$\text{And } \boxed{\max_{x \in [-1, 1]} |f(x)| = 1}$$

