

## Derivatives

### Pset 4 (4 pts each)

Due October 15

- (1) Notes H.8:2
- (2) Notes H.9:6,7
- (3) Page 155:8
- (4) We define a set  $A \subset \mathbb{R}$  to be dense in  $\mathbb{R}$  if every open interval of  $\mathbb{R}$  contains at least one element of  $A$ . Let  $A$  be a dense subset of  $\mathbb{R}$ . Let  $f(x)$  be a continuous function such that  $f(x) = 0$  for all  $x \in A$ . Prove that  $f(x) = 0$  for all  $x \in \mathbb{R}$ .
- (5) Let  $f(x)$  be a continuous function on  $[0, 1]$  and consider  $w \in \mathbb{R}$ . Show that there exists  $z \in [0, 1]$  such that the distance between  $(w, 0)$  and the curve  $y = f(x)$  is minimized by  $(z, f(z))$ . (Hint: Notice I'm not telling you to find the value for  $z$ , just to show it exists. If you can figure out the right function to use and the right theorem to reference, this will be quick!)
- (6) Page 173:7

Bonus: Notes H.10:10

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