

Math 221 Quiz 7

Name _____ Section _____ Score ____/10

Instructions.

Please make sure to SHOW YOUR WORK, and do NOT skip steps.

1. (5 pts) Consider $f(x) = 3 + \arctan(2x)$.

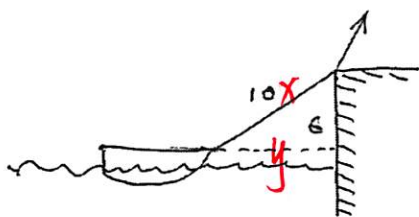
(a) $f'(x) = ?$ (b) Does $f(x)$ increase, decrease or neither?

$$f'(x) = \frac{2}{1+(2x)^2} > 0 \quad \text{increase.}$$

2. (5 pts) (from 2014 Fall midterm2)

A boat is pulled towards the dock by a rope from the bow through a ring on the dock 6 ft above the bow. The rope is hauled in at the rate of 2 ft/s. How fast is the boat approaching the dock when 10 feet of rope are out?

[The picture is a screenshot of that midterm. Copyrights belong to the professor. :)]



$$x: \text{length of rope} \quad \frac{dx}{dt} = 2 \quad x = 10$$

$$y: \text{distance of boat from dock} \quad \frac{dy}{dt} = ?$$

$$x^2 = 6^2 + y^2$$

$$\underbrace{2x}_{10} \underbrace{\frac{dx}{dt}}_2 = 2y \underbrace{\frac{dy}{dt}}_{\downarrow}$$

$$y = \sqrt{x^2 - 6^2} = \sqrt{10^2 - 6^2} = 8$$

$$10 \cdot 2 = 8 \frac{dy}{dt}$$

$$\Rightarrow \frac{dy}{dt} = \frac{2 \cdot 10}{8} = \frac{5}{2} \text{ ft/s}$$