

This is an open-book, open-notes quiz, and you may take as much time as you like. However, work alone; tutors, other students, internet, and so on are off limits. Write your answers on this quiz sheet and have it ready to turn in at the beginning of class of Thursday September 22.

(12 pt) 1. Let f be the function defined by $f(x) = x^3 - 3x$

a. Compute the average rate of change in f over the interval $[-1, 1]$.

b. Write an equation for the secant line which meets the graph of f at $x = 1$ and $x = 2$.

c. Evaluate $f(x + \Delta x)$

(Your answer should be a simple formula involving the two variables x and Δx .)

d. Evaluate and simplify the following quotient as much as possible:

(To fully simplify it, you'll probably need to expand a power in the numerator, simplify by combining like terms, and factor. Show your steps.)

$$\frac{f(x + \Delta x) - f(x)}{\Delta x}$$

(4 pt) 2. True/False.

Scoring: 3 correct = 4pt, 2 correct = 2pt; otherwise, 0pt.

- _____ a. If the average rate of change in f over $[0, 10]$ is negative, then f must be decreasing over $[0, 10]$.
- _____ b. If f is a linear function, then f has the same average rate of change over every possible interval.
- _____ c. Every polynomial function has at least one real zero.

(2 pt) 3. Which of the following functions has / have a constant rate of change (the same average rate of change over every possible interval)?

Circle *all* of the functions that fit the description.

- a. x^2 b. \sqrt{x} c. $(x - 2)(x + 3)$ d. $5/x$ e. $8x + 13$

(2 pt) 4. Give an example of a polynomial of degree 3 which rises to the right, falls to the left, and has $x = 1$ as a zero.