Topic #9: Interpreting Derivative (Math 31)

1. Goals (Section 3.4):
    a. Derivative as instantaneous rate of change
    b. Notations
2. Notations: Newton versus Leibneiz.
3. Derivative as Velocity (use Sec 3.4: 151, 153)
    a. "Displacement" function (or "distance" function): Displacement is the distance from some specified position.
        i. Visual examples
            1. I do car (with variable t in hours)
            2. They try ball in the air (do with t in seconds), to height = ceiling of room
        ii. Find some values.
    b. What is "velocity"?
        i. Examples: MPH, KPH, Feet/Sec, Meters/Min
            1. Change in displacement/ time elapsed
        ii. Examples with pictures above.
        iii. Called "Average Velocity"
        iv. Average velocity is the slope of the secant line
        v. Instantaneous velocity: Speedometer in a car
        vi. If a function is a displacement function, its derivative is the velocity
        vii. Average velocity: Do with formula of displacement function.
        viii. What is negative velocity?
    c. Negative velocity.
4. Different rate of change example: Population growth
    a. Draw p(t).
    b. Average rate of growth
    c. Instantaneous rate of growth
    d. Do logistic and ask where is maximum rate of growth.
    e. Example:
        i. Suppose population f(t) = 1+ (1/100)te^t
        ii. Find population at t = 3, 6, 9.
        iii. Find rate of population increase at t = 3,6,9
        iv. If rate held fixed at t = 6, what would population be at t = 9?
        v. Draw a graph of a population growing with constant rate of increase
    f.
5. Marginal cost, profit, revenue.
    a. Just the derivative
    b. Or as they often think: Change from adding one more item.
    c. Example: Section 3.4: 161
6. In general:
    a. Given a function f(x), there is its average rate of growth on interval.
    b. Its instantaneous rate of growth at a is f'(x).

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7. Derivative as rate of change.
    a. Given a function f(x), f'(x) is the instantaneous rate of change of f at x.
    b. Do avg rate of change
    c. Approximate instantaneous with sequence of averages.