Part I: Derivatives and Graphs (50% of test)

Things You Should Know by Heart

1. What does $f'(x)$ tell us about $f(x)$?

- $f'(x) > 0 \longleftrightarrow f(x)$ is <u>increasing</u> at x

- $f'(x) < 0 \longleftrightarrow f(x)$ is <u>decreasing</u> at x

- $f'(x) = 0 \longleftrightarrow f(x)$ <u>has a critical point</u> at x

2. What does $f''(x)$ tell us about $f(x)$?

- $f''(x) > 0 \longleftrightarrow$ Concave Up (Smile)

- $f''(x) < 0 \longleftrightarrow$ Concave Down (Frown)

- $f''(x) = 0 \longleftrightarrow$ Inflection Point

3. What does $f''(x)$ tell us about $f'(x)$?

Note: This is basically item #1 above

- $f''(x) > 0 \longleftrightarrow f'(x)$ is <u>increasing</u> at x

- $f''(x) < 0 \longleftrightarrow f'(x)$ is <u>decreasing</u> at x

- $f''(x) = 0 \longleftrightarrow f'(x)$ <u>has a critical point</u> at x

Be Able To:

① I give you <u>formula</u> for $f(x)$. You tell me

- ⓐ Where increasing/decreasing
- ⓑ Where relative max/min are
- ⓒ Where concave up/concave down + find inflection point
- ⓓ What graph looks like
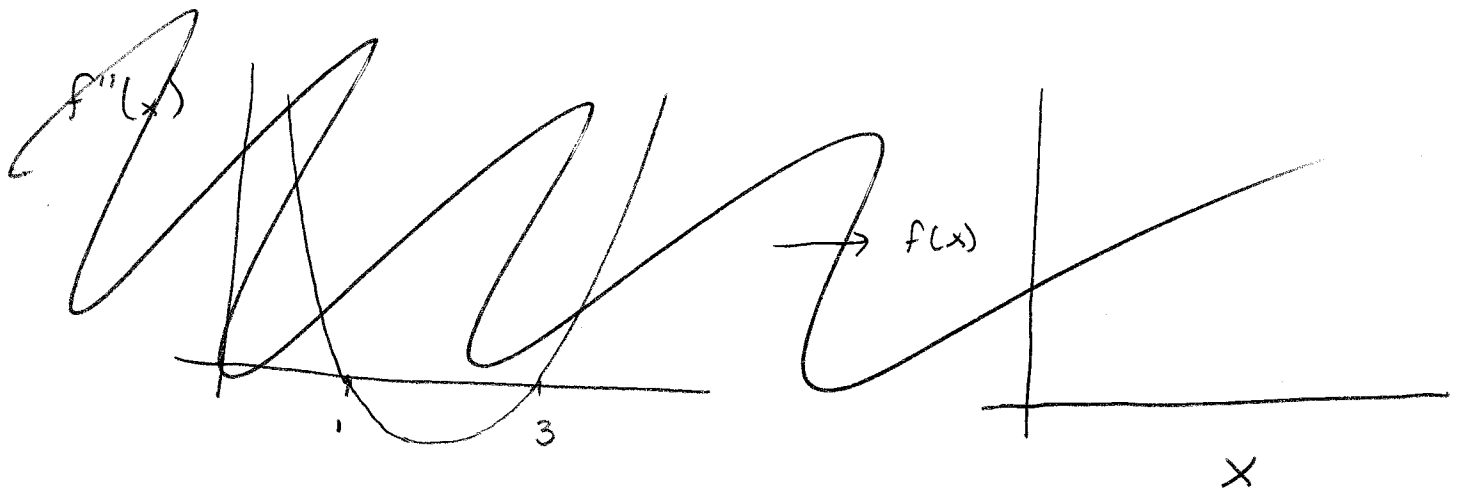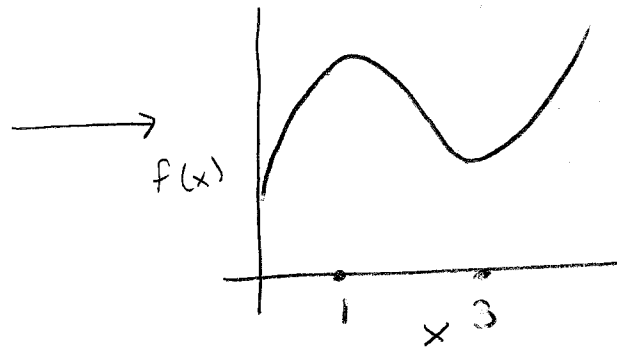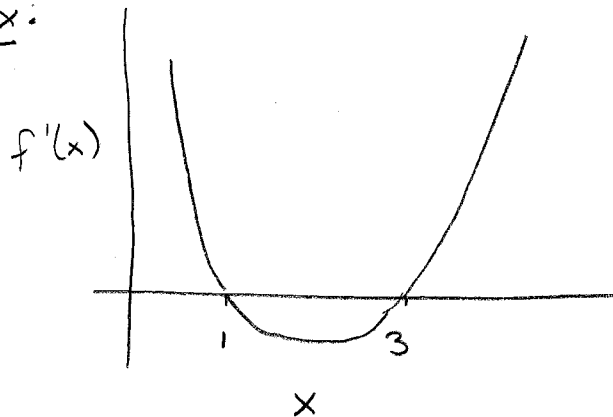
Problems: 2.3 # 9-28, Quiz #2

② I give you graph of f(x). Look at graph to give me info about derivatives

Problems: 2.2 # 19, 23 - 32

③ I give you information about f'(x) or f''(x). Be able to use this information to say something about f(x)

Ex:

④ Which function is the derivative of the other?

Problems: Derivatives + Graphs Worksheet.

⑤ Be able to do ② — ④ with real life quantities instead of abstract functions

Problems: Back page of Derivatives + Graphs Worksheet
1.8 # 12, 18   2.1 # 25, 26, 28

Part II: Optimization (30% of test)

Be Able To

- Find absolute max/min of $f(x)$ for x in $[a,b]$
- Solve optimization problems (Use step by step process from worksheet)

Practice Problems: Worksheet # 1, 2, 6, 8 (3, 4, 7 could be bonus)
2.5 # 11, 13, 20

2.7 # 9, 18

Part III: Derivatives and Continuity (10% of test)

Know

- Definition of continuity ($\lim\limits_{x \to a} f(x) = f(a)$)
- 3 ways $f'(a)$ DNE
    1) $f(x)$ not continuous at $x = a$
    2) Vertical tangent at $x = a$
    3) Cusp/Sharp point at $x = a$

Be Able To

- Identify if a function is continuous and/or differentiable by looking at graph

Problems: 1.5 # 1-12,

Other Stuff
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KNOW 3 DEFINITIONS ☆ OF THE DERIVATIVE ☆

- Make sure you are OK with derivative notation (y', $f''(x)$, $\frac{d^2}{dx^2} f(x)$, $\frac{d^2y}{dx^2}$, etc)

- No Calculators

- Show work

Easiest Ways to Fail
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1.) Don't show up (Taking test early is OK)

2.) Cheat

3.) Don't know exponent rules or how to take derivatives