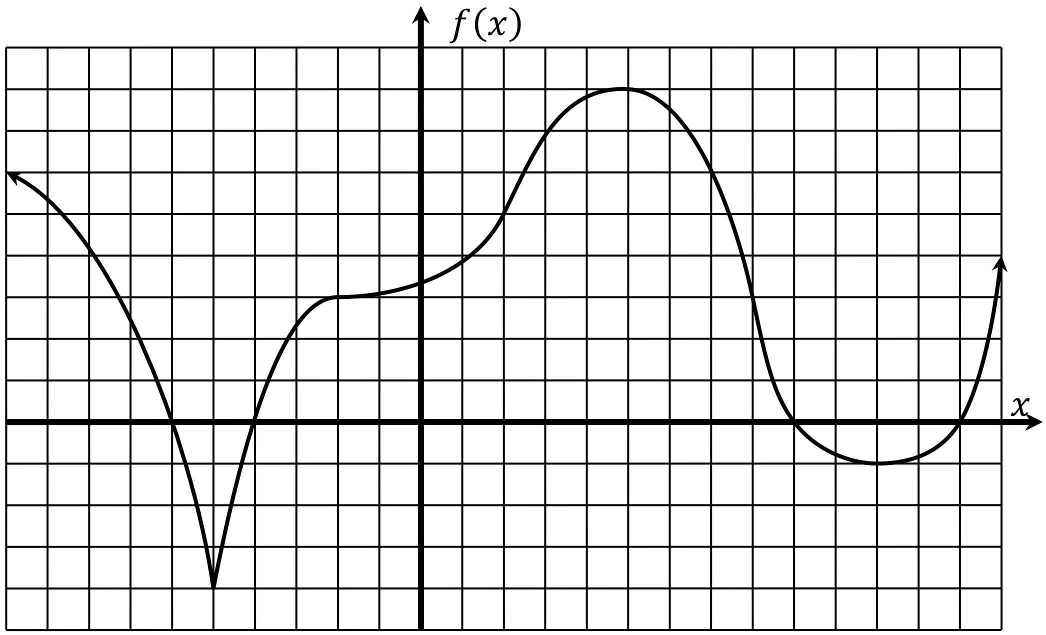
## Section 4.1 Class Drill: First Derivatives and Graphs (Four Parts)

### Section 4.1 Class Drill Part 1: Identifying Two Kinds of Graph Behavior

based on exercise 4.1#9, which is problem #1 on MyLab Homework Homework H53

The graph of a function $f$ is shown below.




(1) At which $x$-values is $f$ zero?

(2) On what intervals is $f$ positive?

(3) On what intervals is $f$ negative?

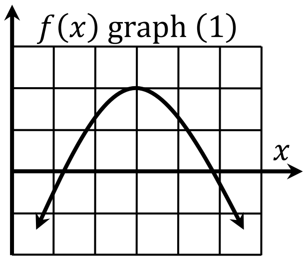
(4) At which $x$-values is the line tangent to the graph of $f$ horizontal?

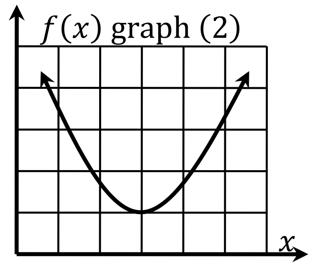
(5) On what intervals is $f$ increasing?

(6) On what intervals is $f$ decreasing?

**Section 4.1 Class Drill Part 2: Match the Graph of $f$ to the Sign Chart for $f'$**

based on exercise 4.1#19,21,23, which are problems #3,4,5 on MyLab Homework Homework H53



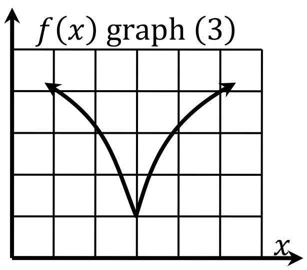



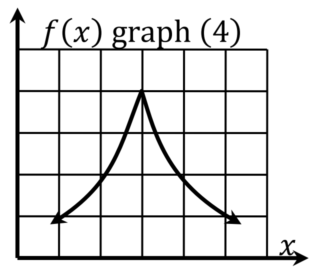

(a) $f'(x)$: --------- 0 +++++ ($x = 3$)

*Sign chart (a) matches graph ____.*

(b) $f'(x)$: --------- ND +++++ ($x = 3$)

*Sign chart (b) matches graph ____.*



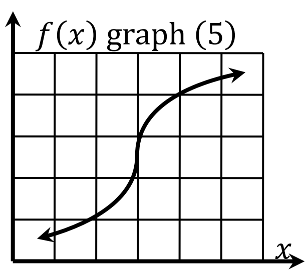



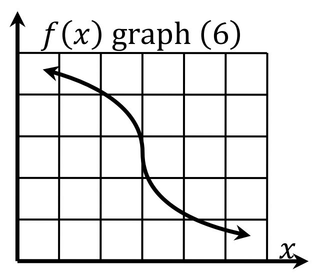

(c) $f'(x)$: +++++ 0 +++++ ($x = 3$)

*Sign chart (c) matches graph ____.*

(d) $f'(x)$: +++++ ND +++++ ($x = 3$)

*Sign chart (d) matches graph ____.*



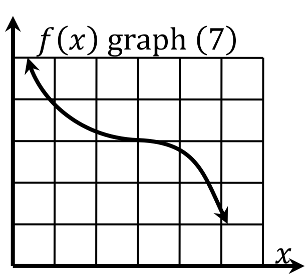



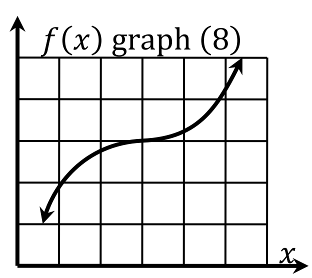

(e) $f'(x)$: +++++ 0 -------- ($x = 3$)

*Sign chart (e) matches graph ____.*

(f) $f'(x)$: +++++ ND ------- ($x = 3$)

*Sign chart (f) matches graph ____.*




(g) $f'(x)$: --------- 0 -------- ($x = 3$)

*Sign chart (g) matches graph ____.*

(h) $f'(x)$: --------- ND -------- ($x = 3$)

*Sign chart (h) matches graph ____.*

## <u>Section 4.1 Class Drill Part 3: Using the 1st Derivative Test with Given Info about $f$ and $f'$</u>

based on exercise 4.1#17, which is problem #1 on MyLab Homework Homework H56

**<u>The First Derivative Test for Local Extrema</u>**

**Test 1:** $f'(c) = 0$ or $f'(c)$ $DNE$

If the number $x = c$ passes test 1, then $c$ is called a *partition number for* $f'$.

**Test 2:** $f(c)$ exists.

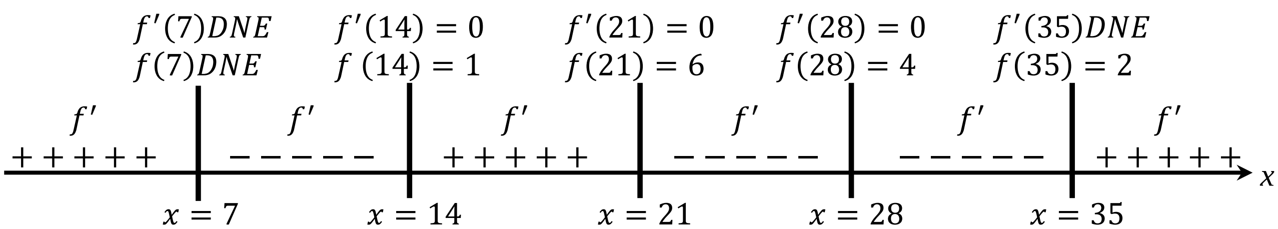
If the number $x = c$ passes tests 1,2, then $c$ is called a *critical number for* $f$.

**Test 3:** $f$ is continuous at $x = c$.

**Test 4:** $f'$ changes sign at $x = c$.

If the number $x = c$ passes tests 1, 2, 3, 4, then $c$ is the *location* of a local max or min of $f$. The *value* of the local max or min is the corresponding $y$ value, $f(c)$.

For some function $f$, a sign chart for $f'$ is given, along with important $y$ values for $f$. Assume that $f$ is continuous everywhere on its domain. That is, $f$ is continuous at all $x$ values where $f(x)$ exists.




| (A) Fill in this table: | $c = 7$ | $c = 14$ | $c = 21$ | $c = 28$ | $c = 35$ |
|---|---|---|---|---|---|
| Test 1: Is it true that $f'(c) = 0$ or $f'(c)$ is undefined? | | | | | |
| Test 2: Is $f(c)$ defined? | | | | | |
| Test 3: Is $f$ continuous at $x = c$? | | | | | |
| Test 4: Does $f'$ change sign at $x = c$? | | | | | |

(B) Based on your table, what are the $x$-coordinates where local extrema occur? For each one, say whether it is a local max or a local min.

(C) What are the corresponding $y$-coordinates? That is, what are the values of the local extrema?

(D) Sketch a possible graph of $f(x)$.

## Section 4.1 Drill Part 4: Using the First Derivative Test on a Function Given by a Formula

based on various exercises from Section 4.1, which are on MyLab Homeworks H54, H55

The goal is to use the 1st Derivative Test to find all local extrema of $f(x) = 2x^3 - 3x^2 - 12x + 13$

(A) Find the Critical Numbers for $f(x)$.

(B) Make a Sign Chart for $f'(x)$. Be sure to label the chart clearly and show how the signs are created.

(C) Using the information from your sign chart, find the intervals on which $f(x)$ is increasing and the intervals on which $f(x)$ is decreasing. State your conclusions clearly in a sentence.

(D) Also using the information from your sign chart, find the $x$-values where $f(x)$ has a local max or a local min. (This is where you use the First Derivative Test) (Be sure to say which type, max or min.)

(E) Find the corresponding $y$-values.