Name: _____

# Sketching Graphs of Functions—A Qualitative Approach II

Fill in the blanks in the sign charts with the terms "increasing," "decreasing," "concave up," or "concave down." Then sketch the graph of a function which matches the given criteria on a sheet of graph paper.

**Each graph should be at least a quarter sheet of graph paper.** *Label the $x$-axis. Also label each "important" point (that is point where the first or second derivative is equal to zero or is undefined) with an ordered pair of the form $(a, f(a))$. (For example, if the $x$-coordinate is 3, label the point as $(3, f(3))$ since we are not given the value of $f(3)$.)*

1. Let $f$ be continuous on $\mathbb{R}$ with     $f'(1)$ undefined     and     $f'(5) = 0$.

| interval | $(-\infty, 1)$ | $(1, 5)$ | $(5, \infty)$ |
|---|---|---|---|
| sign of $f'(x)$ | $-$ | $+$ | $-$ |
| behavior of $f$ | | | |

2. Let $f$ be continuous on $\mathbb{R}$ with     $f'(-10) = 0$     and     $f'(15)$ undefined.

| interval | $(-\infty, -10)$ | $(-10, 15)$ | $(15, \infty)$ |
|---|---|---|---|
| sign of $f'(x)$ | $+$ | $+$ | $-$ |
| behavior of $f$ | | | |

3. Let $f$ be continuous on $\mathbb{R}$ with     $f'(0.5)$ undefined     and     $f'(1.5) = 0$.

| interval | $(-\infty, 0.5)$ | $(0.5, 1.5)$ | $(1.5, \infty)$ |
|---|---|---|---|
| sign of $f'(x)$ | $+$ | $-$ | $-$ |
| behavior of $f$ | | | |

4. Let $f$ be continuous on $\mathbb{R}$ with     $f'(-2)$ undefined     and     $f'(4)$ undefined.

| interval | $(-\infty, -2)$ | $(-2, 4)$ | $(4, \infty)$ |
|---|---|---|---|
| sign of $f'(x)$ | $+$ | $-$ | $+$ |
| behavior of $f$ | | | |

| interval | $(-\infty, -2)$ | $(-2, 4)$ | $(4, \infty)$ |
|---|---|---|---|
| sign of $f''(x)$ | $+$ | $+$ | $-$ |
| behavior of $f$ | | | |

5. Let $f$ be continuous on $\mathbb{R}$ with $\quad f'(100)$ undefined.

| interval | $(-\infty, 100)$ | $(100, \infty)$ |
|---|---|---|
| sign of $f'(x)$ | $+$ | $+$ |
| behavior of $f$ | | |

| interval | $(-\infty, 100)$ | $(100, \infty)$ |
|---|---|---|
| sign of $f''(x)$ | $+$ | $-$ |
| behavior of $f$ | | |

6. Let $f$ be continuous on $\mathbb{R}$ with $\quad f'(-5)$ undefined, $\quad f'(0) = 0,$ $\quad f'(-5)$ undefined, $\quad$ and $\quad f''(0) = 0.$

| interval | $(-\infty, -5)$ | $(-5, 0)$ | $(0, 5)$ | $(5, \infty)$ |
|---|---|---|---|---|
| sign of $f'(x)$ | $+$ | $+$ | $+$ | $-$ |
| behavior of $f$ | | | | |

| interval | $(-\infty, -5)$ | $(-5, 0)$ | $(0, 5)$ | $(5, \infty)$ |
|---|---|---|---|---|
| sign of $f''(x)$ | $+$ | $-$ | $+$ | $+$ |
| behavior of $f$ | | | | |

7. Let $f$ be continuous on $\mathbb{R}$ with $\quad f'(-10)$ undefined, $\quad f'(-5) = 0,$ $\quad f'(0)$ undefined, $\quad$ and $\quad f''(-5) = 0.$

| interval | $(-\infty, -10)$ | $(-10, -5)$ | $(-5, 0)$ | $(0, \infty)$ |
|---|---|---|---|---|
| sign of $f'(x)$ | $-$ | $-$ | $-$ | $-$ |
| behavior of $f$ | | | | |

| interval | $(-\infty, -10)$ | $(-10, -5)$ | $(-5, 0)$ | $(0, \infty)$ |
|---|---|---|---|---|
| sign of $f''(x)$ | $-$ | $+$ | $-$ | $+$ |
| behavior of $f$ | | | | |

8. Let $f$ be continuous on $\mathbb{R}$ with $\quad f'(-2)$ undefined, $\quad f'(3)$ undefined, $\quad$ and $\quad f''(1) = 0.$

| interval | $(-\infty, -2)$ | $(-2, 3)$ | $(3, \infty)$ |
|---|---|---|---|
| sign of $f'(x)$ | $-$ | $-$ | $-$ |
| behavior of $f$ | | | |

| interval | $(-\infty, -2)$ | $(-2, 1)$ | $(1, 3)$ | $(3, \infty)$ |
|---|---|---|---|---|
| sign of $f''(x)$ | $-$ | $+$ | $-$ | $+$ |
| behavior of $f$ | | | | |