

## 5.9 Connecting $f$ , $f'$ , and $f''$

Calculus

Name: \_\_\_\_\_

CA #1

1. A particle's position along the  $x$ -axis is measured by  $x(t) = t^3 - 15t^2$  where  $t > 0$ . Find the intervals where the particle is speeding up. Find intervals where the particle is slowing down.

2. A particle's position along the  $y$ -axis is measured by  $y(t) = t^3 - 12t^2 + 45t + 7$  where  $t > 0$ . Find the intervals where the particle is speeding up. Find intervals where the particle is slowing down.

For each table, selected values of  $x$  and  $f(x)$  are given. Assume that  $f'(x)$  and  $f''(x)$  do not change signs. Answer the questions for each table.

3.

$x$	$f(x)$
0	-10
1	-8
2	-5
3	-1

- a. Is  $f(x)$  increasing or decreasing?
- b. Is  $f(x)$  concave up or concave down?

4.

$x$	$f(x)$
2	-7
3	-8
4	-10
5	-13

- a. Is  $f(x)$  increasing or decreasing?
- b. Is  $f(x)$  concave up or concave down?

5. Given the function  $g(x) = -x^3 + 2x^2$ , find the interval(s) when  $g$  is concave **down** and **increasing** at the same time.

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6. Given the function  $h(x) = x^3 + x^2 - 5x$ , find the interval(s) when  $h$  is concave **up** and **decreasing** at the same time.

Answers to 5.9 CA #1

1. Speeding up: $(0, 5)$ and $(10, \infty)$ Slowing down: $(5, 10)$	2. Speeding up: $(3, 4)$ and $(5, \infty)$ Slowing down: $(0, 3)$ and $(4, 5)$	3a. Increasing 3b. Concave up
4a. Decreasing 4b. Concave down	5. $\left(\frac{2}{3}, \frac{4}{3}\right)$	6. $\left(-\frac{1}{3}, 1\right)$