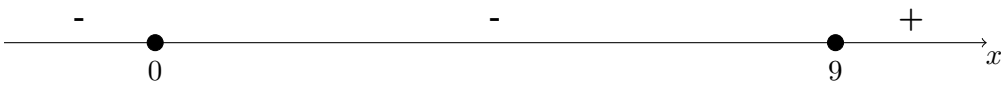
Quiz

Directions: Carefully read each question below and answer to the best of your ability in the space provided. You **MUST** show your work to receive full credit!

1. (5 points) Suppose $f(x) = x^4 - 12x^3 + 5$. Find the intervals on which $f(x)$ is increasing and the intervals on which $f(x)$ is decreasing.

Solution: Setting $f'(x) = 4x^3 - 36x^2 = 4x^2(x-9) = 0$, we can find critical numbers which are $x = 0$ and $x = 9$.

$$\text{if } x < 0 \ : f'(-1) = 4(-1)^2(-1-9) = -40 < 0$$
$$\text{if } 0 < x < 9 \ : f'(1) = 4(1)^2(1-9) = -32 < 0$$
$$\text{if } x > 9 \ : f'(10) = 4(10)^2(10-9) = 400 > 0.$$

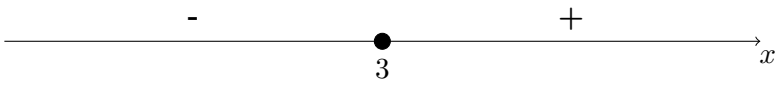


Now as $f'(x)$ is negative when $x < 0$ and $0 < x < 9$, so $f(x)$ is decreasing on the interval $(-\infty, 0) \cup (0, 9)$, and $f(x)$ is increasing in the interval $(9, \infty)$.

2. (5 points) Find the intervals on which $g(x) = x^3 - 9x^2 + 6x + 5$ is concave up and the intervals on which $g(x)$ is concave down.

Solution: To find the interval on which $g(x)$ is concave up and concave down. We need to check the sign of the second derivative. Note that: $g''(x) = 6x - 18 = 6(x-3) = 0$ when $x = 3$.

$$\text{if } x < 3 : g''(0) = 6(0-3) = -18 < 0,$$
$$\text{if } x > 3 : g''(4) = 6(4-3) = 6 > 0.$$



So $g(x)$ is concave up on the interval $(3, +\infty)$, and $g(x)$ is concave down on the interval $(-\infty, 3)$.

Name: _____

Section (circle one): 021 022 023 024

Question:	1	2	Total
Points:	5	5	10
Score:			