

5. (8 points) (a) Find a value of k so that the function

$$f(x) = \begin{cases} 1 - x, & \text{if } x < 3; \\ kx - 4k, & \text{if } x \geq 3. \end{cases}$$

is continuous on every interval.

(b) Is the function you found differentiable at $x = 3$? Explain why or why not.

6. (12 points) Are the given statements true or false? Give an explanation for each answer.

(a) If the graph of a function g is obtained by shifting the graph of a function f vertically upward by 3 units, then $g' = f' + 3$.

(b) If a function is not differentiable then it is not continuous.

(c) If $f'' > 0$, then f is increasing.

(d) The inequality $\sqrt{x} < 2 \log(x^4)$ holds for large positive values of x (that is, as $x \rightarrow +\infty$).